Engineering

ELECTRICAL WORLD

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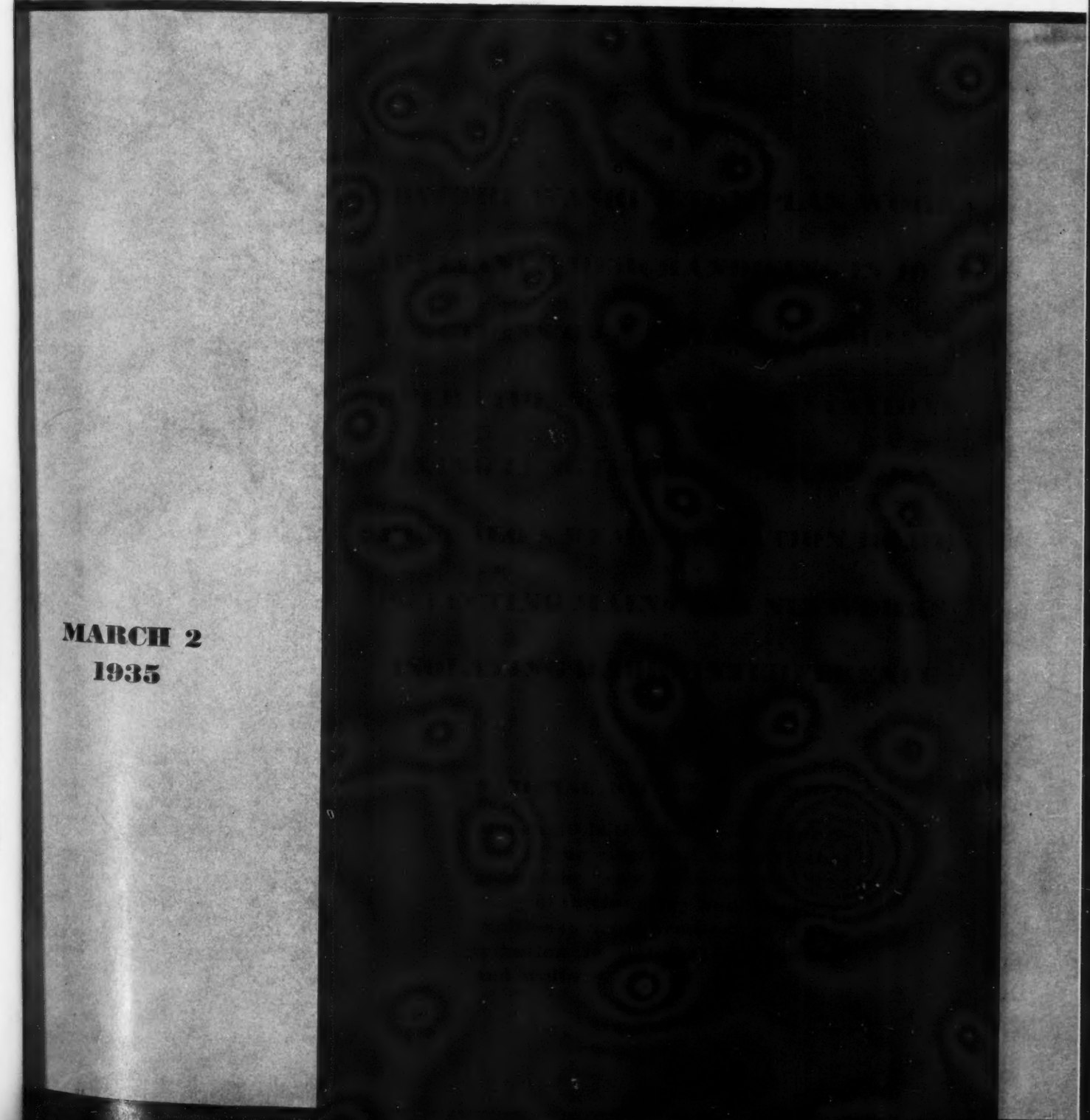

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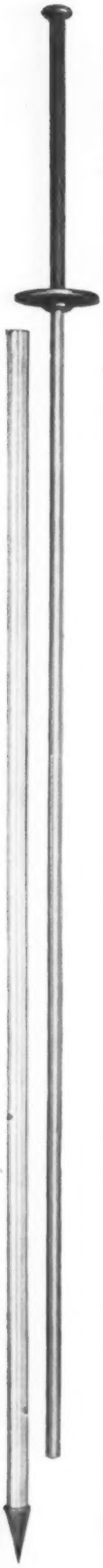

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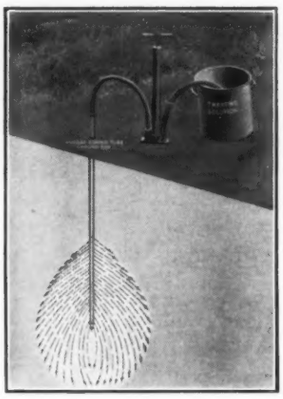

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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Trends

As Gleaned From This Issue of "Electrical World"

▸▸Regulation in the Capital

At the nation's capital there has been a sustained experiment in regulation of electric rates extending over a period of ten years. The scheme is distinctive and its results good. So much so that senatorial and bureaucratic fingers have been pointing to it as a model with yardstick virtues. More recently the Consolidated Gas companies have proposed the same sort of plan to the New York city and state authorities. One article in this number tells why the plan has worked in Washington. Any other community can see from it whether local circumstances justify consideration of it as a way out of perennial rate disputes.

▸▸Holding Company Function

Squeezed on one side by the depression and on the other by the Administration, the holding companies are bowing to the exigencies of the times and changing their habits and habiliments. Those few which went into bankruptcy changed a bit more drastically, of course, but their new scheme of operations under court guidance must be somewhat of an index of which way all will move —more or less. The Middle West story is given here for that reason.

▸▸Electric Heat Applications Not a Fad

Wherever heat is required in industrial or commercial processes experience has shown that it pays to examine the benefits of electric heat. Increasing applications thereof for melting, superheating, duplexing, annealing, carburizing, malleableizing, enameling, baking, etc., are demonstrating this fact. While comparative costs of heat alone may not justify the change, adaptability of electric heat to any location, accurate control of product giving uniformity and reducing rejects, avoidance of oxidizing action and other benefits contribute to profits. In this issue are presented the considerations which induced the Ingram-Richardson Manufacturing Company to substitute electric enameling for fuel-fired furnaces and add other electric furnaces in 1934.

▸▸All Eyes on Rates

What is the most important element in utility management? Closely tied with the answer given by A. Emory Wishon, president of the San Joaquin Power Corporation, in the interview in the current issue, is the rate problem, the essential features of which are discussed by him. How much would the agitated rate reductions mean to a customer per day? What has made public attention concentrate on rates? What is the remedy? These and other questions are answered in the interview. Some intimate details of this company's original "free electricity" plan and the subsequent "inducement offer" and "half-off" program are included.

▸▸Gaging High Voltage

For some time the industry has been doing its high-voltage measuring by extrapolation of standards accepted for lower voltages. Power is propagated at moderate frequencies, but lightning propagates itself at very high ones. The new technique of sphere gap measurement of the high voltages takes account of those differences so that line insulation, bushings and transformer windings can be designed to perform best under both exposures to high voltage. A Westinghouse engineer paves the way for extending the measuring stick a bit higher toward the clouds.

▸▸Burning Networks Clear

In almost every other part of the system the aim is usually to keep short circuit currents from getting too large or lasting too long. But where underground networks are employed the reverse is true. Fault currents must be allowed to rise and last to the point where they will burn themselves clear and do it quickly. L. J. Weed in this issue gives pointers in design so that this condition may be insured by the conductors used and the way they are installed.

▸▸Energy Sales

Year-end returns from electric light and power companies make a favorable showing as to energy sales and revenue. The trend continues upward and the margin of gain is gradually widening. Actual totals for 1934 surpassed the estimates. The new figures show the revised breakdown among the several classes of consumers, and they afford a measure of what is going on in different parts of the country. Meanwhile, the weekly output, recorded to the third week in February, is virtually up to predepression levels. This curve will deserve watching.

▸▸How Long a Counterpoise?

To conquer the obstinate tendency of the ground to show high resistance, the counterpoise is gaining in favor. Much of the practice so far has been empirical, but experience and theory are establishing a basis for predetermining how long these shallow, buried ground wires should be. A General Electric engineer-mathematician congeals these gains into a formula that should make for better results, in dollars and performance.

▸▸Minimizing Interference From Power Lines

When power lines were first accused of interfering with radio reception there was great consternation because investigations usually revealed the fact that the majority of disturbances were due to other causes. After criticism became more closely confined to utility responsibility, it was often found that removal of power-line interference eliminated incipient power-service troubles. What was once considered a nuisance became an aid to service maintenance. Now commercial radio broadcasting and receiving equipment constitutes valuable load, collectively, so there is another incentive to avoid interference. In this issue H. N. Kalb, Pacific Gas & Electric Company, relates how his company is isolating radio interference produced or picked up by the power circuits.

BUILD REVENUE AND GOOD WILL

YOU have every reason to expect a continued increase in your domestic loads.

Already the effects of the "Better Light—Better Sight" campaign are being felt. Refrigerator, range, and other load-building campaigns will boost the load some more.

Your meters must be right—they must be accurate—if you are to obtain all the benefits of this constantly increasing load.

Creating Good Will

There is another sound reason for making certain that your watthour meters are accurate. If you can assure your customers that bills for power are correct—neither too high nor too low—you are creating good will.

Look to Your Meters

For nearly half a century, General Electric has made good watthour meters. Millions are still in service.

But meters produced years ago do not have the long-range accuracy necessary to register modern loads properly. Nor are they immune from the effects of changes in operating conditions. Only modern meters can yield the proper returns from most of your residential customers during the coming decade. Today, General Electric produces such meters, and their salient features are given below.

A Sound Investment

Many service companies have proved to their satisfaction that when all factors are considered, the systematic retirement of old watthour meters is a sound investment.

You may want to continue your investigations to determine just what retirement will mean to your system. In this work our meter specialists will be able materially to assist you. To obtain their services, simply address the nearest G-E sales office.

THE MODERN G-E WATTHOUR METERS are known as Types I-20A, I-20B, I-20C, and I-20S. They are all fundamentally the same, differing only in the method of mounting.

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They have high torque, which gives sustained accuracy for long periods of time. Their performance is but little affected by variations in voltage, frequency, wave form, or temperature. In every respect, they are modern meters.

For complete information about G-E watthour meters, address the nearest G-E sales office, or General Electric, Schenectady, N. Y.

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GENERAL ELECTRIC

ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

MARCH 2, 1935

The Abolition of Holding Companies

BIGGEST GUN in the barrage of reform that drum-fires its preparation for recovery are the Rayburn-Wheeler bills to dissolve all holding companies. There is an element in Congress that would disintegrate all large business enterprises. The centering of the artillery preparation on utilities is thought by the authors and cohorts to be good strategy. It may be so. There are four hundred-odd holding companies listed on the New York Stock Exchange and only forty of them are utilities. Voters are more conscious of their names than of the names of the others. The citizenry lives on more intimate terms with utilities than with other great companies.

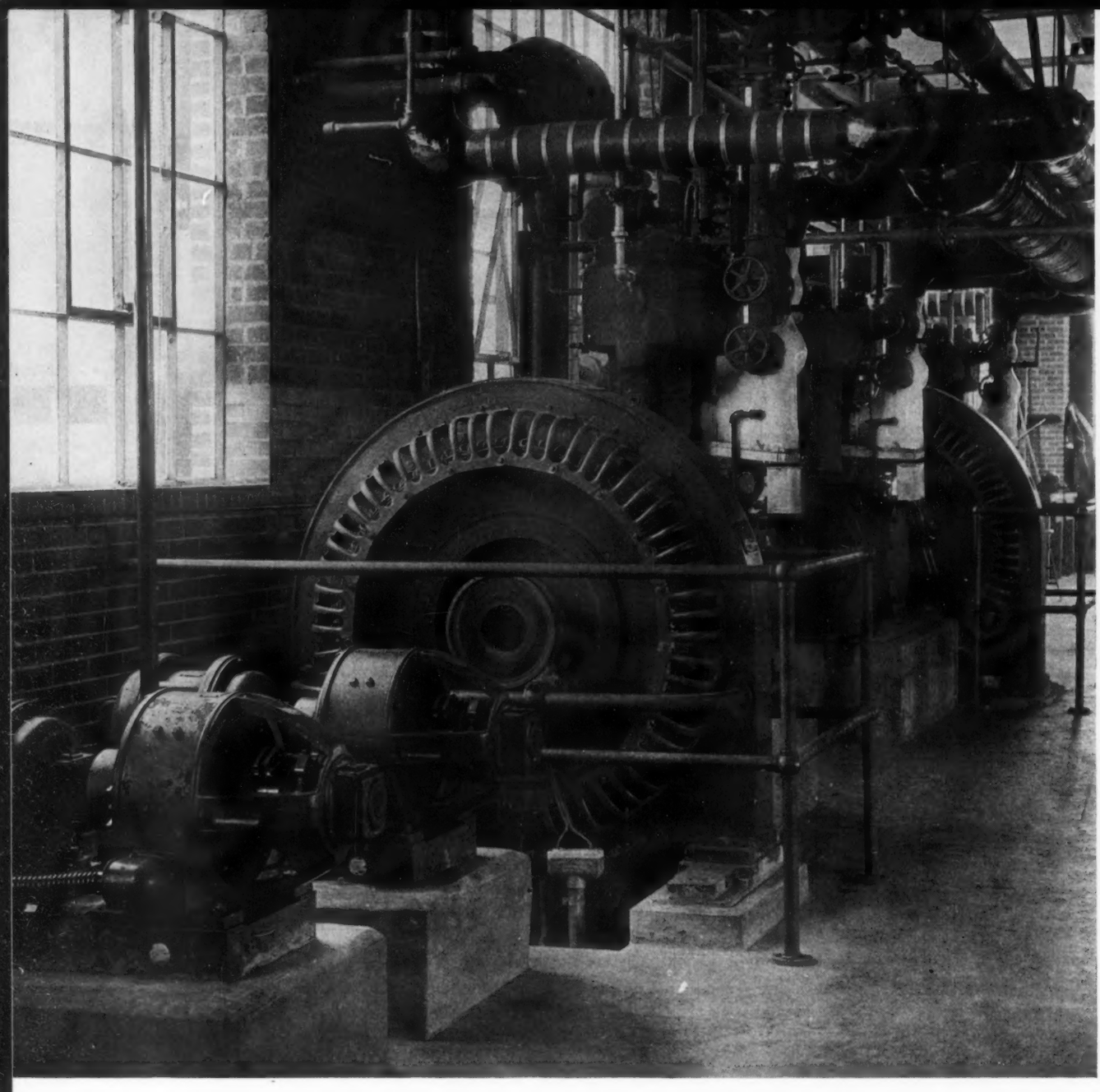
Holding company uses, not abuses, are efficiencies—efficiencies that result from the binding together of separate forces of policy, finance and service. These holding companies are agencies in these efficiencies. It is proposed to regulate their faults of morals and manners by abolishing them. It is not wished to be helpful by regulation that would prevent abuses. This would be welcomed. It is desired to be destructive by abolition.

The bills add nothing to regulatory powers looking to fair rates. Why? Because this is already attended to by the several regulatory commissions, which work clearly and fairly on bases of costs and values. The bills add nothing to a protective system against speculative abuses in holding company securities. Why? Because this security field is adequately protected elsewhere, in other measures. What the bills do is to abolish—that is, to confiscate—bond and stock values belonging to hundreds of thousands of investors. The bills would drive an unnatural wedge between holding and operating companies, an action by edict, in contempt of the unity of the industry. They ignore that achieved unity; they abolish it. A fairly common antipathy to large, well-organized business things is represented by these bills. They have a background in the 256 press releases of the Federal Trade Commission. The majority of these are scathing, prejudiced, exaggerated and distorted expressions of this general naïve instinct. So these bills. Conception in ignorance, birth in emotion.

The holding company in utilities has two clearly defined jobs—to manage, in return for a fair fee; to provide sound investments for public savings. It is an expert manager, adviser, efficiency doctor; it is an investment trust. It understands policy and it understands diversification. S.E.C., plus the state commissions, can regulate these two jobs fully, effectively and fairly.

A third function of the utility holding company is scarcely a job, because it is more than a job; it is an imponderable job. It is the exercise of judgment about operating company policy through its voting control. This is an art; there must be justice in this. Going too far is as bad as not going at all. There must be a balance between freedom and restraining discipline. Autonomy for operators and executive decentralization is the régime in use at this moment. But individual cases demand individual treatment. Decisions on utility matters that require experience and judgment go where these unweighable values are—in the heads of executives, many of whom are in the holding companies. Executive thought will fit ill in straitjackets, for it is of the essence of thought that it should have discretion. These bills are straitjackets. There will be left no discretion. Needed judgment and experience will be lost.

If Congress weighs facts and policies, if it acts carefully and constructively, if it listens to business men and investors who can and should speak, it will find this legislation destructive, unnecessary and unwise. It will see that the Rayburn-Wheeler bills strike at the foundation of an industry that is vital to recovery.



BREWERIES ADD NEW LOAD

One of the most active markets for new electric load is the brewery. A modern 250,000-barrel-a-year brewery uses about 1,400,000 kw.-hr. a year. About 60 per cent of the load is for refrigeration and 40 per cent for auxiliary motor operation. The combination of electric power and process steam offers opportunity for an interesting economic and engineering analysis to get the most efficient operation. Brewery applications are typical examples of industrial modernization through electrification.

The Washington Plan Works

Good Results Obtained With Rates Automatically Adjusted to Earnings Based on a Progressively Corrected Rate Base

By A. E. KNOWLTON
Associate Editor

THE Washington Plan is a plan for periodic rate adjustment in the light of each year's earnings. It does not confirm any particular form of rate schedule except that some forms of rate schedules may lend themselves more readily to the annual adjustment which the earnings dictate according to the plan. Rates are being fixed practically automatically to divide the profit with the consuming public (via rate reductions) whenever the margin of earnings exceeds a stated percentage. It is thus more a case of profit regulation than of orthodox rate regulation.

Wrangling had bedeviled the electric rate situation in Washington for years. Directly under the eye and influence of the reformers who swarm about the capital, the District of Columbia Public Utilities Commission could hardly be inert or inept. It fixed "fair" values, which the company, however, considered unfair. Litigation got intricate, while an impounded $6,401,576, or marginal earning, lay idle awaiting court decree as to its disposition. This characterizes the history well enough up to December 31, 1924. The District of Columbia Supreme Court on that date confirmed the agreement that had been reached to short circuit all the litigation by applying the "sliding scale" rate powers in paragraph 18 of the enabling act of the district commission.

Briefly, the plan initially was as follows:

> If the return on $32,500,000 should prove to be more than 7½ per cent, then half the excess would be applied to rate reduction for the ensuing year. If it fell below 7½ per cent for five consecutive years, below 7 per cent for three years or below 6½ per cent for twelve consecutive months the commission would have to restore the 7½ per cent return by raising rates. The impounded fund was to be shared equally with the customers.

The company at once promulgated a 7½-cent top rate; it had formerly been 10 cents. Output for the following year increased 18 per cent and the net return exceeded 9 per cent. A 7-cent rate was fixed for 1926. By this process the rate got down to 4.2 cents top for 1931 and the earnings still kept above the datum level; in fact, they averaged above 10 per cent over the seven-year period in spite of the reduction each year that virtually donated half the 3 per cent excess to the customers in rate reductions. The commission next promulgated an order modifying the decree so as to reduce the rate of return to 7 per cent and also reduce the company's share of the excess—it became a "second order" sliding scale. The ultimate result after another court action (February 8, 1933) now stands this way:

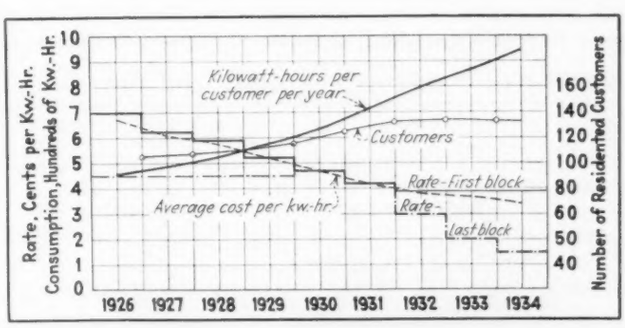
> If the amount earned in any one year is more than 7 per cent and not more than 8¼ per cent of the rate base the rates for the following twelve months, based on the business done during the twelve months in which such excess occurred, shall be so adjusted that the gross receipts of the company shall be reduced by 50 per cent of such excess. If the amount of return is in excess of 8¼ per cent and not more than 9 per cent, an additional amount of 60 per cent of that excess over 8½ per cent shall be applied to rate reduction. If the amount earned is in excess of 9 per cent, further additional amount of 75 per cent of the excess over 9 per cent shall be devoted to rate reduction.
>
> Conversely, if the rate of return for any two consecutive years falls below 6¾ per cent of the rate base for each of those years, or if the rate of return for any consecutive twelve-month period falls below 6½ per cent of the rate base for that period, the commission shall promptly decree an increase sufficient to yield a 7 per cent return.

In shortest possible language, the features are thus as follows:

1. There is an annual adjustment of rates, *either up or down*, according to earnings.
2. There is an incentive to the company to labor for an increased return above the basic figure.
3. The plan tends to stabilize the earnings on a rate base which is continually adjusted in practical accord with the prudent investment concept.
4. Depreciation reserves set up by the company are also adjusted annually.
5. It tends to persuade the community that it is getting its service on a predetermined cost basis.

Plan aids rate evolution

Now for the results. From a public relations standpoint there is no question that the results have been good. Whether the decreases in rates and increases in consumption that have paralleled its functioning are the results of the plan, or the results of progressive changes in rate technique, or the result of local factors that differentiate Washington somewhat from other places is, however, an open question. It should be recognized that the post-war, pre-decree era saw a great increase (115 per cent from 1919 to 1924) in the number of homes and retail commercial establishments in the city. Average use per customer and rates hardly changed, however, during this period. From the diagram it may be seen how the rates and consumption have changed during the period while the original decree and its subsequent modifications have been operating. The present domestic rate is 3.9 cents for the first 50 kw.-hr., 3.3 cents for the next 50, 2 cents for the next 100 and 1.5 cents for the excess. (For 1935 a reduction of approxi-



Usage more than doubles while rate is halved.

Table I—Nearly 500 Kw.-Hr. More per Year for Only $1.72 Additional

	Residential		Retail Commercial	
	1926	1934	1926	1934
Average annual kw.-hr. per customer	456	941	4494	7874
Average annual bill per customer	$30.68	$32.40	$231.82	$225.54
Average charge per kw.-hr. (cents)	6.73	3.44	5.16	2.86

mately $147,000 is indicated and the new rate is reported to be 3.9 cents for the first 50 kw.-hr., 3.1 for the next 50, 1.9 for the next 100 and 1.5 for the excess.)

It is evident that development of both the domestic and retail commercial business during the last ten years has verged on the dramatic. Average annual residential usage has grown 106 per cent and the average annual bill has been increased less than 6 per cent. Commercial retail users are taking 75 per cent more and actually paying 3 per cent less annually. Expressed in other terms, the average residential rate in 1934 was 49 per cent less than in 1926 and the commercial 45 per cent less. In 1926 the residential consumption was 7 per cent above the national average, and now it is 49.5 per cent above that figure. The average residential bill in Washington for 1934 was $32.40, and this is $0.80 less than the corresponding national average. Expressed differently, Washington residents consume 49.5 per cent more and pay for each unit 35 per cent less than the average American. Similar results could be cited from the experience with the retail commercial users. All this is the direct outcome of an evolution of rates that capitalize the tranquillity which the plan fostered.

Some of the credit for the outstanding series of rate reduction, increased usage and increased earnings is certainly to be attributed to the fact that the city has had relatively little depression locally. It is the place where people congregate to rescue the rest of the country from the depths of despond and they are paid a bit above the trend elsewhere for their kind ministrations. In short, earning capacity has been reasonably well maintained, the population and number of customers has increased and with them the electric refrigerator and small appliances have become increasingly popular, although no definite figures of saturation are available.

The population could afford to buy the devices and the rates were progressively conducive to their use. The plan made the reductions both possible and necessary. Helped also by the atmosphere which surrounds the functioning of the plan, the rates have therefore established independently an accomplishment that lends added luster to the efficacy of the plan. Ranges are really just coming into use, but there is still no appreciable number of electric water heaters in service. There is a domestic power rate for current for these major appliances on a separate meter, but the number of customers availing themselves is not large enough to disturb the inferences drawn from the basic residential rate.

Table II — Customers Shift to Higher Consumption Brackets

Consumption Block (Kw.-Hr.)	Percentage of Customers Oct., 1931	Oct., 1934
0 to 20	17.2	9.5
21 to 40	30.1	21.0
41 to 50	11.2	9.2
51 to 60	8.2	8.0
61 to 70	6.2	7.7
71 to 100	12.4	19.3
101 to 200	11.9	20.9
201 and over	2.8	4.4
	100.0	100.0

Table III—Allocation of Washington Output and Revenue

	Average No. of Customers	Revenue $	Revenue Per Cent of Total	Amount Kw.-Hr.	Amount Per Cent of Total	Average Price Cents per Kw.-Hr.
Residential	137,504	$4,455,280	36.93	129,353,400	23.60	3.44
Commercial retail	19,151	4,319,334	35.80	150,794,600	27.51	2.86
Commercial wholesale	141	1,658,156	13.74	134,396,700	24.52	1.23
Other	40	1,631,772	13.53	133,583,500	24.37	1.22
Total	156,836	$12,064,542	100.00	548,128,200	100.00	2.20

The company has maintained an effective sales department which has not, however, engaged in spectacular seasonal merchandising campaigns. Unusual activity on the part of the merchants has meanwhile promoted the use of appliances, particularly in the homes.

One point of interest in such an analysis is the extent to which the rate adjustments have succeeded in shifting consumers as a whole into higher consumption brackets. This is difficult to indicate in simple manner, because individual customers from month to month will shift from one block to another. Nevertheless, data for October are usually considered indicative, even though the other months would show appreciably different distribution. From the accompanying table it is seen that in October, 1931, 33 per cent of the customers used more than 60 kw.-hr., which was the average residential consumption for that month. Three years later approximately 38 per cent of the customers used more than 79 kw.-hr., which was the average for October of 1934. Simultaneously there was a gratifying decrease in the percentage of customers having minimum bills, a drop from 15 to 8 per cent. Those who fell in the 0 to 20-kw.-hr. bracket were practically halved in percentage of the total. The 75-cent minimum charge included 17 kw.-hr. in 1931 and 19 in 1934.

Another table shows that the consumption was divided in almost equal proportions among the four classes of users. These data also reveal that the disparity between average rates to these classes is less pronounced than in many places—merely another way of reminding one that Washington is hardly to be classed as as industrial city. The way in which these respective loads contribute to the load factor and the plant factor is indicated by the fact that the 220,000 kw. of power plant capacity in 1934 handled a peak load of 164,000 kw. at 46 per cent annual load factor. The rate base was $61,760,000 for 1933; the 1934 figure is now in process of calculation.

One final word of interpretation and caution—it has taken ten years of painstaking evolution to bring about all these enviable results. The plan is a model primarily in the sense that it prepares a quiescent arena in which to move rates in such a direction as to convince the customer he is sharing the benefits with the company as fast as the gains become established.

Selecting Network Mains

Sequence Component Impedances Fix Secondary Main Sizes to Burn Clear on Network Faults

By LESLIE J. WEED

Electrical Engineer
Edison Electric Illuminating Company
of Boston

CHOICE of secondary main sizes to insure burning clear on network faults hinges on establishing minimum values of fault-circuit impedances from the transformers to the most remote fault location. Impedance of the transmission circuits which are of the order of 5 per cent of the value of the network transformer and secondary connection impedances can be neglected. The solution for the balanced circuit can be carried out on a single-phase basis. For the circuit unbalanced by fault conditions the positive-, negative- and zero-sequence impedances are to be determined, otherwise one cannot be sure that balanced line-to-line and double line-to-ground faults will clear. Fortunately the latter procedure is relatively simple because the system is symmetrical except at the fault itself. Each sequence network may be solved on a single-phase basis.

In general the negative-sequence network will be identical with the positive except that it contains no source of emf. In the case of the zero-sequence network impedance for the three mains in parallel with ground return the resistance component is

three times that of the three mains in parallel. Proximity effect on current division can be ignored, but sheath-losses and earth-path resistance cannot be. In this study, however, it is assumed that the return current flows only in the sheaths. This gives sufficient accuracy for the purpose in question.

It was further assumed that four single-conductor, lead-covered cables will be in sheath contact throughout, without transposition, and have uniform current distribution in conductors and sheaths. Thereupon calculations of the respective zero-sequence impedances by the flux-linkage method results in a value which is 2.5 times the value of the positive-sequence impedance in the case of the four No. 4/0 single-conductor cables. This relation is taken to hold for the other sizes of cables employed.

Calculations of short-circuit current

If a network is so designed that sufficient short-circuit current be available at a fault occurring at the location of a vault assumed out of service, or at a fault occurring midway between vaults assumed to be in service, then at any other location on the network there would always be sufficient fault current regardless of network supply conditions.

In view of the fact that the curves of Fig. 1 are straight lines, it is possible to obtain from them the number of units necessary to feed into a fault for any symmetrical spacing of units. For example, if the units are spaced 500 ft. apart it would be necessary to have only half the units which would be required with the 1,000-ft. spacing assumed, etc.

At the 750-ft. spacing one unit feeding into a phase-to-ground fault will provide (Fig. 3) the required 3,000 amp. and two units feeding into a three-phase fault, or three units feeding into a two-phase-to-ground fault will provide the necessary 6,000 amp. to clear the fault. Of course, these curves not being straight lines, it is impossible to read directly from them the amount of fault current avail-

Network cables must of course be large enough to carry the load and give good voltage regulation. Also they must burn clear in case of fault. Kehoe, Sutherland and MacCorkle, Westinghouse and Rockbestos engineers, have reported tests which show that about 6,000 amp. is required to clear copper-to-copper faults on No. 4/0 non-metallic or lead-sheathed cables. To obtain these fault currents sufficiently low impedances and adequate feed capacities must be afforded. The author shows how they can be estimated for prevailing networks.

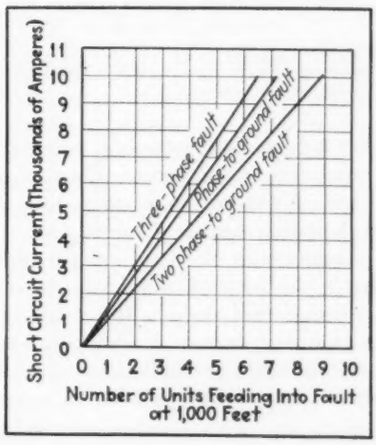


Fig. 1—Two working units will clear phase-to-ground fault at unit out of service

In the case of a phase-to-ground fault (the most common type) the 3,000 amp. necessary to burn clear will very nearly be obtained with minimum of two units feeding into the fault from a distance of 1,000 ft. For the much less common three-phase and two-phase-to-ground faults (requiring 6,000 amp. to clear in No. 4/0 cables) a minimum of four units within 1,000 ft. for the three-phase and six for the two-phase-to-ground faults.

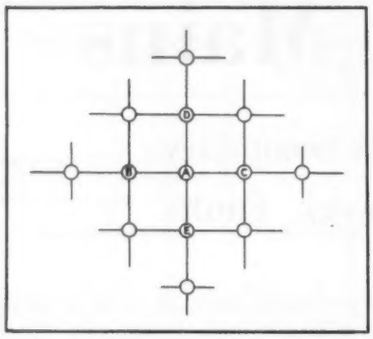


Fig. 2—Four units feed each fault in conventional network

(From Fig. 1) 750 ft. is minimum distance from which four units can supply 6,000 amp. into a two-phase-to-ground fault at A. For units on outer edge of network the spacing will be governed by number of units available to feed into fault.

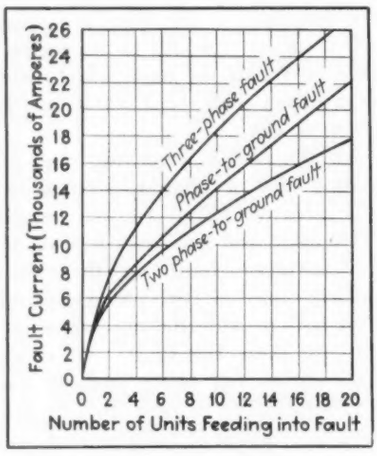


Fig. 3—One unit enough for phase-to-ground fault, three for two-phase-to-ground

Units assumed to be 750 ft. apart and fault midway between two units with all units in service.

able for any other spacing, but with a knowledge of the factors affecting the shape of the curves a very close approximation can be obtained.

Comparison of Figs. 1 and 3 shows that if the network is laid out in such a manner that there will be sufficient short-circuit current available to clear a two-phase-to-ground fault occurring at the location of a unit out of service, then at any other location on the network there will be sufficient current available to clear any type of fault.

Calculation of transformer spacing

The curves in Fig. 4 show the necessary transformer spacing for various load densities in the range from 1,000 to 10,000 kva. per $\frac{1}{16}$ square mile for 150-, 300- and 450-kva. transformer units. These curves are based on uniform spacing of the transformers in each area, as in Fig. 2, with allowance being made for one transmission line with its associated transformers being out of service in each case. It was found that the total number of transformers of a certain size required to supply any definite load in an area with one line out of service are practically independent of the number of lines, in all cases where there are four or more transformers per line; therefore, these curves may be taken as representative of all supply conditions which might arise on any satisfactorily designed network.

Even in those areas of the lightest load density where we might expect to install a secondary network, assuming the installation of the largest size transformer units (although smaller size units in the light load density areas would undoubtedly be installed), the maximum spacing of transformers would be in the neighborhood of 450 ft. As the load density increases the transformer spacing would decrease.

Returning to the curve of a two-phase-to-ground fault in Fig. 1 (previously shown to be the limiting case) and assuming uniform transformer spacing of 450 ft. instead of 1,000 ft., the 6,000 amp. required to clear the fault will be obtained with only three units feeding into the fault, or in other words, the transformers can be laid

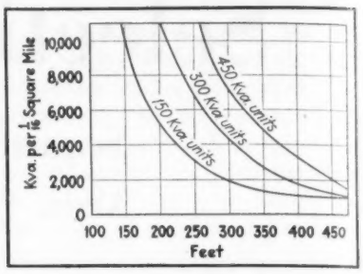


Fig. 4—Maximum feasible spacing of transformers 450 ft. for lowest load densities

out with a uniform spacing of 450 ft. with the assurance that there will be sufficient short-circuit current available even on the fringe of the network to burn clear any type of fault that might be expected to occur.

As a result of this study, it is apparent that if the secondary network is properly laid out, with sufficient transformers to supply the existing load and allowance being made for certain transmission lines and their associated transformers being out of service, then at any point on the network we may be assured of having sufficient short-circuit current available to burn clear any type of fault.

The current and voltage characteristics of secondary networks for satisfactory current capacity and voltage regulation will be considered in a later article.

ARTIFICIAL SUNLIGHT FOR HOSPITAL PATIENTS

National Carbon Co.

The four arcs of the ceiling fixture operate in succession, in the Grasslands Hospital, Valhalla, N. Y., change from one to another being automatic. Patients placed in the circle of cots are each exposed to the same amount of ultra-violet radiation.

Holding Company Revised

Middle West Utilities Company Presents a Statement of Its Relationships to Subsidiary Companies at Kansas Election Contest

IN A recent municipal ownership election in Emporia the Kansas Electric Power Company made a statement in behalf of the Middle West Utilities Company, under whose management it operates. It was a detailed presentation of the policies and practices now governing this holding company, under the direction of Daniel C. Green, trustee, appointed by the Federal District Court of the Northern District of Illinois. As reorganized, this company is being managed and operated as an investment company, its principal assets consisting of stocks and bonds and notes receivable of public utility subholding companies and operating companies. The company also maintains in its central office a staff of public utility specialists to render certain services for the operating companies in the group.

The rules now governing the relationships with subsidiary companies are:

1. In exercising its rights as a stockholder, whether owning a part or all of the common stock or voting control of a company, it is the policy of the management to recognize and respect the rights and interests of the bondholders and preferred-stock holders of such a company. In other words, the management looks upon its affiliated companies as independent, corporate entities in the strictest sense of the word.

2. The policy of the company is to prohibit any so-called "up-stream loans." It recognizes that the company is merely a stockholder and the fact that it might control all or a majority of the common stock of another company gives it no right to borrow money from that company any more than any other stockholder.

3. The company is not permitted to loan money or securities to any of its officers or directors.

4. The company has sent to all affiliated corporations a suggested form of resolution to be passed by their boards of directors prohibiting the loaning of money or securities to any of their officers or directors. The suggested resolution provides that a copy be sent to all officers and directors of such corporations.

When a holding company is under court observation in receivership what it does for and with its subsidiaries is certainly somewhat of an index of acceptability in functioning.

5. The company will not charge any affiliated company a fee or commission for services rendered in connection with the issuance or sale of any new securities. It will charge no fee nor commission for services rendered such companies in connection with the purchase or sale of any properties.

6. Annual certified audited reports of Middle West Utilities Company and its controlled affiliated companies will be made by independent public accountants.

7. The company does not own, nor does the trustee propose to organize, any subsidiary construction or engineering company, it being the policy that if any local company should need the services of an outside engineering and construction company it will go into the open market and secure these services at the most reasonable cost.

8. As a means of expediting the recovery and development of the affiliated companies, and to provide assistance to operating officials in the field, a limited staff of public utility specialists is maintained in the central office. The personnel comprising this staff were carefully selected for their experience and ability in constructive utility operation. The scope of the services to be performed by such supervisory staff is to be limited to the needs of the operating companies. No services are to be rendered by this staff that can better and more cheaply be performed by the local company. The supervision agreement between the company and its affiliated companies describes in detail these services and the charges to the operating companies are limited specifically to (a) supervision services, (b) traveling auditing services, and (c) income tax services.

9. The supervision fee now being charged is six-tenths of 1 per cent of the operating revenues (as defined in the contracts) of the affiliated companies. The services of traveling auditors and income tax department are being billed at cost. The supervision fee recently has been reduced from three-fourths of 1 per cent to six-tenths of 1 per cent.

10. The purchasing department of the supervisory staff in this office negotiates blanket purchase agreements with manufacturers and agencies and any purchases under these blanket agreements are at the option of the operating companies. All discounts or quantity discounts provided in these blanket agreements are passed on to the company making such purchase, and no part of these discounts is retained by Middle West Utilities Company.

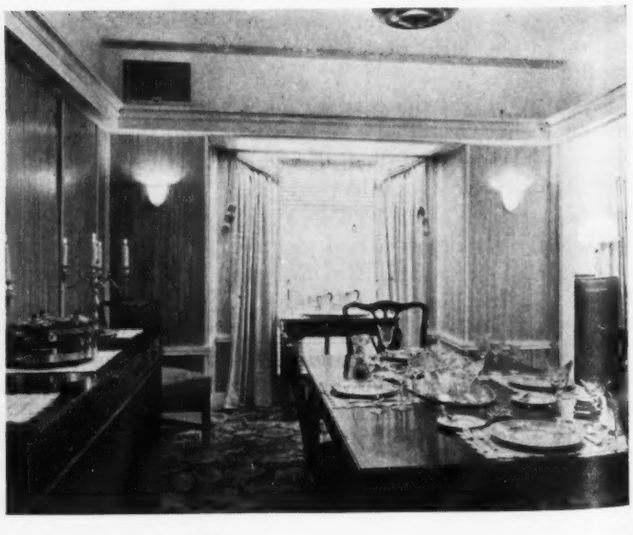
11. The primary purpose of maintaining a supervision staff is to meet the needs and requirements of the operating companies, and not for profit purposes.

12. No officer, director or employee of Middle West Utilities Company is now or will be on the payroll of any company that has entered into a supervision agreement with Middle West Utilities Company.

The Emporia election was decided in favor of continuing the private operation of the local utility, based on this statement.

New Demonstration Home in Buffalo

Buffalo General Electric Company has just installed this modern electric home in its office building in the shopping center. It is a mine of home-making ideas for any woman, embracing lighting, heating, decorating and furniture arrangement, the thousand little things that make a home distinctive. Equipment was provided through the co-operation of 82 Buffalo firms. The suite is air conditioned and presents a profusion of electrical conveniences and the appealing possibilities of modern lighting.



Fixing Counterpoise Length

Best Results When Length in Thousands of Feet Is One-Sixth of Wave-Front Time in Microseconds

By L. V. BEWLEY . . . J. H. HAGENGUTH
General Electric Company, Schenectady, N. Y.

The counterpoise is gaining in favor as a means of reducing stresses on line insulation under surge conditions. But its theory is complicated and therefore practice has lagged. Here the counterpoise is given a simplifying boost that bases its length on lightning wave-front time. In view of prevailing span lengths it appears that many parallel counterpoises are going to be continuous.

COUNTERPOISES are installed primarily to reduce the tower footing resistance in cases where other means of grounding have failed and to reduce the line insulator stresses due to its coupling action with the overhead wires. But what is the impedance of a counterpoise and how much coupling can be expected? What is the most effective length for each counterpoise wire?

The proper criterion would seem to be:

The length of each counterpoise wire in thousands of feet need not be longer than one-sixth the shortest front in microseconds of any lightning surge to which it may be subjected, and its length should be such that its leakage resistance is less than its surge impedance.

This condition insures that the full length of the counterpoise will have been reduced to substantially its leakage resistance value by the time the shortest front wave has reached its crest, and that the voltage will never exceed that permitted by the surge impedance only. If a longer counterpoise is used its minimum leakage resistance will not be available for the shortest front waves, although to be sure it will yield additional benefits for fronts longer than the minimum front, but for such a case much greater advantage can be obtained by increasing the number of counterpoise wires.

The advantages of employing a given amount of wire as a multiple counterpoise are deducible from Fig. 4. Increasing the number of wires and decreasing their lengths proportionally results in two substantial gains: (1) The initial surge impedance is reduced, and (2) the transition time is shortened. However, a condition of diminishing returns is soon reached beyond which it is not profitable to increase the number of counterpoise wires by shortening their lengths. Finally, for a large number of short counterpoises, three detrimental effects make themselves felt: (a) The waves on the short counterpoise wires are not so completely absorbed, and therefore return to the tower as positive reflections, resulting in a boosting of the tower voltage; (b) the close proximity of the counterpoise wires results in an appreciable mutual impedance between them, and, finally (c) for very short wires the earth current does not have an opportunity to find as great a depth of penetration (and therefore reduced resistance) as in the case of longer wires—the end effect.

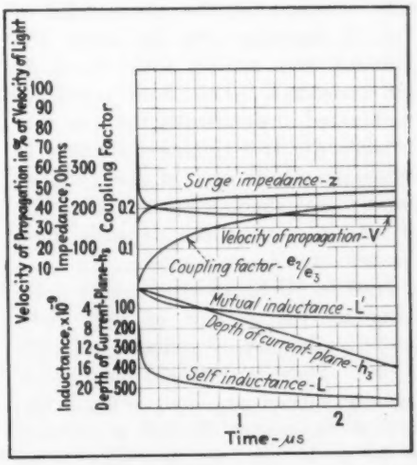


Fig. 1—Effectiveness of counterpoise depends on depth of earth current penetration

From the above considerations, and assuming that the shortest front of a lightning surge will not be less than one microsecond, it appears that the most desirable length for a counterpoise wire is 200 to 300 ft., where the leakage resistance is less than 200 ohms. If the leakage resistance exceeds 200 ohms, then the length should be increased until the leakage resistance is less than the surge impedance. In practice this will usually mean a continuous tower-to-tower counterpoise.

Multi-velocity wave theory is basis

The theory of the counterpoise* is based on the general theory of multi-velocity waves, which gives the explanation for a number of observed phenomena which could not be explained by previous theories. From these investigations the following points stand out:

1. The surface of the earth may be taken as the zero plane for the electrostatic field or voltage images.
2. The equivalent zero plane of the current images is below the surface of the earth, its depth depending on the resistivity of the soil and the length of the traveling wave. That is, it is a variable, starting close to the earth's surface, penetrating into the soil, and rising again as the wave passes by.
3. The wave induced on an overhead conductor from a buried counterpoise is therefore purely an electromagnetic wave.

The velocity of propagation on the counterpoise is

$$v = \frac{1}{\sqrt{LC}} \qquad (1)$$

The surge impedance of the counterpoise is

$$Z = \sqrt{\frac{L}{C}} \qquad (2)$$

The amplitude of the induced wave e_2 is given in terms of the wave on

*"The Counterpoise," by L. V. Bewley, *G.E. Review*, February, 1934. "Field Tests and Theory of the Counterpoise," by L. V. Bewley, *Electrical Engineering*, August, 1934. "Discussions," by J. H. Hagenguth, Pacific Coast convention A.I.E.E., 1934.

the counterpoise e_3 as (the coupling factor):

$$e_3/e_2 = \frac{L'}{L}\left(\frac{1}{1 + v/V}\right) \qquad (3)$$

Where:

L = Self-inductance of counterpoise.
L' = Mutual inductance with overhead conductor.
C = Ground capacitance of counterpoise.
V = Velocity of light.

From these simple expressions three facts are evident:

(a) C is practically constant; however, L and L' increase as the depth of the current penetration in the earth increases. Therefore, the velocity decreases, consequently; the wave front is flattened, the length is elongated, and the tail is built up. This helps explain the characteristic distortion of traveling waves, particularly short waves below the corona limit.

(b) As L increases the surge impedance increases, but more slowly after the current penetration reaches some depth. On this account the current and voltage waves become dissimilar.

(c) As the current penetrates, both L and L' increase, but at different rates, while V decreases, so that coupling initially increases. Very soon, however, the coupling reaches a substantially constant value. As a result, the wave induced on an overhead conductor will be similar in shape to the counterpoise current, but the front of the induced wave will be longer on account of the coupling requiring time to reach its final value.

All of the above phenomena have been observed on oscillograms taken on an insulated counterpoise free of leakage effects. Fig. 1 illustrates how the self and mutual inductances, velocity, surge impedance and coupling vary with the depth of penetration of the earth current. Quantitative data on these variations have been secured from field tests on counterpoises.†

Parameters of the buried counterpoise

When a counterpoise is buried in the earth the wire is in direct contact with the soil, which allows the current to enter the earth directly, without passing through an intervening dielectric like the air in the case of an overhead conductor. The amplitude of the current thus diverted is limited by the leakage resistance of the wire to earth. This leakage resistance can be obtained by burying a given length of counterpoise wire, say 200 ft., and measuring its resistance with either an a.c. or d.c. bridge, or other standard method.

The mechanism of the transition of the impedance of a counterpoise from its initial, or surge impedance, value to its final, or leakage resistance, value may be thought of as a great number of minute reflections returning to the sending end from discrete leakage resistances distributed at small intervals along the length of the counterpoise. Therefore, if the counterpoise is long enough so that the final leakage resistance is lower than the initial surge impedance, the transient impedance will change in the fashion shown in Fig. 2, which shows the variation with time of the pure surge impedance, the leakage resistance and their resultant. Extrapolation of the tail of the resultant impedance curve is seen to intersect the vertical axis at the extension

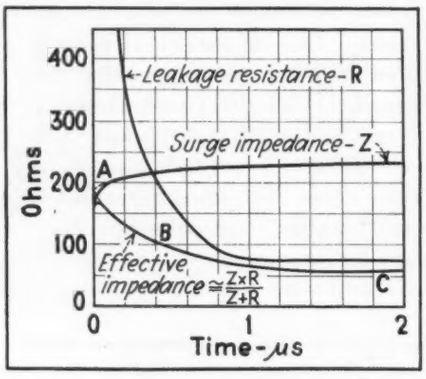


Fig. 2—Impedance of counterpoise falls with surge duration

of the sustained value of the surge impedance curve.

From cathode-ray oscillograms of the voltage and current of the counterpoise the composite impedance curve is obtained as the instantaneous ratio (e/i), and therefrom, by extrapolation, the initial surge impedance. For all practical purposes, then, the impedance curve of the counterpoise may be taken as the curve ABC of Fig. 2, starting with the surge impedance and ending with the leakage resistance. This final resistance is obtained in practically the time that it takes the last minute reflection to return from the end of the counterpoise to the starting point. The time of transition therefore depends upon the velocity of propagation.

Tests in Michigan on a counterpoise lying on the surface of very deep sandy soil gave a velocity of 375 ft./ms. Tests at Pittsfield on a counterpoise buried one foot beneath the surface in gravel showed a velocity of 30 to 40 per cent the velocity of light. Other investigators‡ have reported a velocity of $\frac{1}{3}$ the velocity of light. Thus these test results, secured under different conditions and in widely different localities, confirm the theoretical calculations that *the velocity of propagation on a buried counterpoise is of the order of one-third the velocity of light.* Consequently, the time required nearly to reduce the impedance of a counterpoise to its final leakage resistance value is approximately

$$t_0 = \frac{2\ (\text{length of counterpoise in thousands of feet})}{(\text{Velocity in thousands of feet per microsecond})} = 6l \text{ m.s.} \qquad (4)$$

Examination of the cathode-ray oscillograms of surge tests on counterpoises show that the transient impedance for a rectangular current wave varies roughly in an exponential fashion, and since the transition requires approximately $(6l)$ microseconds, the transient impedance is expressed by

$$Z(t) = R + (Z - R)\,\epsilon^{-t/2l} = Z \text{ at } t = 0 \qquad (5)$$

$$= R + \frac{(Z - R)}{20} \text{ at } t = 6l$$

The equivalent circuit for this function is simply the resistance R in series with $(Z - R)$ shunted by an inductance of such value that the transient is 95 per cent complete in time $(6l)$. As for the initial surge impedance Z, we have: $Z = 220$ ohms from the Michigan[1] tests, $Z = 120$ to $Z = 160$ from the 1934 Pittsfield tests[2], and $Z = 150$ from the 1934 Trafford tests[3]. Furthermore, theoretical considerations indicate that the limits are between $Z = 100$ and $Z = 250$ with probable values from $Z = 150$ to $Z = 200$. It makes little difference in the final results which of these two latter figures be used in calculations, but it is suggested that $Z = 200$ be taken in conservative calculations.

The impedance function of a counterpoise of given length is therefore defined as soon as its leakage resistance has been obtained by measurement.

Now a counterpoise has electromagnetic coupling with the overhead line conductors. It was at one time be-

†"Discussion," by J. H. Hagenguth, A.I.E.E. Pacific Coast convention, September, 1934, Salt Lake City.

‡V. Alguer, *E.T.Z.*, 1933, page 1234.

[1]"Experimental Studies of Lightning Surges on Transmission Lines," by O. Brune and J. R. Eaton, *A.I.E.E. Trans.*, Vol. 50, September, 1931.

[2]"Field Tests and Theory of the Counterpoise," by L. V. Bewley, *Elec. Engr.*, August, 1934.

[3]"Counterpoise Tests at Trafford," by C. L. Fortescue and F. D. Fielder, *Elec. Engr.*, July, 1934.

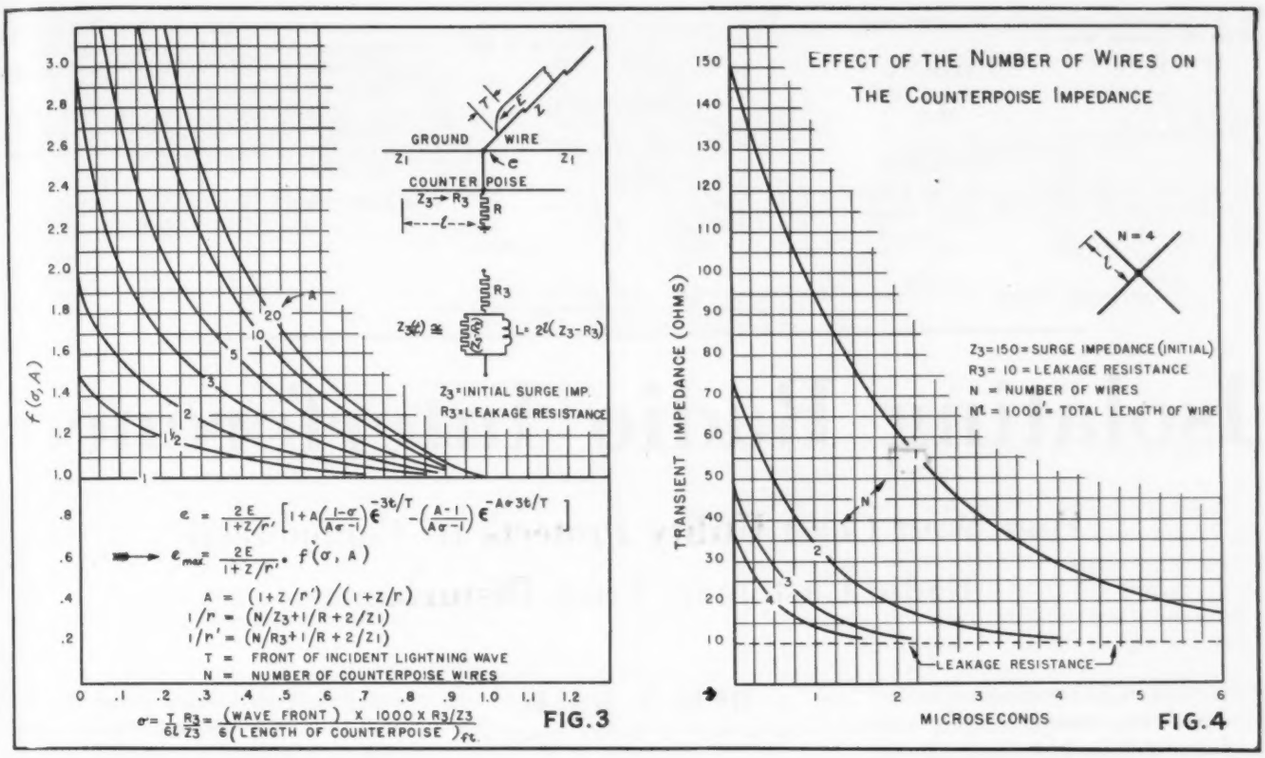

GROUND WIRE
COUNTER POISE
Z3 → R3
R
Z1
Z1
c
l
R3
L = 2l(Z3 - R3)
Z3 = INITIAL SURGE IMP.
R3 = LEAKAGE RESISTANCE
f(σ, A)
e = 2E/(1+Z/r') [1 + A((1-σ)/(Aσ-1)) ε^(-3t/T) - ((A-1)/(Aσ-1)) ε^(-Aσ3t/T)]
e max = 2E/(1+Z/r') · f(σ, A)
A = (1+Z/r')/(1+Z/r)
1/r = (N/Z3 + 1/R + 2/Z1)
1/r' = (N/R3 + 1/R + 2/Z1)
T = FRONT OF INCIDENT LIGHTNING WAVE
N = NUMBER OF COUNTERPOISE WIRES
σ = T/6l · R3/Z3 = (WAVE FRONT) X 1000 X R3/Z3 / 6(LENGTH OF COUNTERPOISE)ft.
FIG. 3
EFFECT OF THE NUMBER OF WIRES ON
THE COUNTERPOISE IMPEDANCE
N = 4
l
Z3 = 150 = SURGE IMPEDANCE (INITIAL)
R3 = 10 = LEAKAGE RESISTANCE
N = NUMBER OF WIRES
Nl = 1000' = TOTAL LENGTH OF WIRE
TRANSIENT IMPEDANCE (OHMS)
LEAKAGE RESISTANCE
MICROSECONDS
FIG. 4

Fig. 3—Counterpoise limits lightning voltage at top of tower

Fig. 4—Four crowfoot radials ample for 1 microsecond wave

lieved by some that this coupling was quite large and therefore would exercise a very beneficial reduction of voltage across the insulators. But theoretical studies showed that:

The additional coupling due to a counterpoise over that given by the ground wire would not exceed 10 *per cent of the ground wire voltage and would more likely be of the order of* 5 *per cent.*

These values have been confirmed by field tests. The additional coupling for the Pittsfield tests was $2\frac{1}{2}$ to 4 per cent, while for the Trafford tests it was 5 to 8 per cent. Certainly, in view of the great uncertainty about the magnitude of lightning surges, this additional coupling can be ignored, or else considered by arbitrarily adding 5 or 10 per cent to the ground wire coupling.

The following table shows the relative contributions of the impedance and the coupling in reducing the stress across the insulators for a lightning voltage E and tower footing resistance of 400 ohms:

Assumed surge impedance of lightning stroke	200	400
Ground wires only (40 per cent coupling)	0.52E	0.34E
With counterpoise, impedance effect only....	0.19E	0.10E
With counterpoise, and 10 per cent extra coupling.	0.16E	0.08E

Thus the great gain effected by a counterpoise is due to its reduction of the grounding impedance.

In consequence, we reach the very important conclusion:

The essential behavior of a counterpoise is as a variable impedance, starting with an initial surge impedance value of about 200 *ohms and decaying by an exponential law to its final leakage resistance value in a time in microseconds equal to six times its length in thousands of feet.*

On this basis the curves of Fig. 3 were constructed, from which the total voltage permitted by a multi-wire counterpoise of any length may readily be determined for a specified lightning surge of any magnitude E and any wave front T. An example will demonstrate the use of these curves.

Let it be required to design a counterpoise for a 132-kv. line having ten-unit insulator strings and 1,000-ft. spans, there being one ground wire having a surge impedance of $Z_1 = 500$ ohms and 15 ft. above the line conductors. Referring to a previous article on "How to Design Ground Wires for Direct Stroke Protection," by L. V. Bewley, ELECTRICAL WORLD, March 17, 1934, we have from Fig. 3 thereof:

Coupling factor for ground wire = 0.30
Permissible kv. across insulators = 1,180 kv.

Assuming that the coupling factor may be increased to 0.35 by the presence of the counterpoise:

$$\text{Permissible kv. on ground wire} \quad \frac{1{,}180}{(1 - 0.35)} = 1{,}815 \text{ kv.}$$

If this line is to be designed for immunity from lightning trouble for strokes up to 15,000 kv. and wave fronts as short as one microsecond ("standard" assumptions at the present time), and if we agree to use counterpoise wires 200 ft. long, and the measured resistances are:

$R_3 = 40$ ohms counterpoise leakage resistance per 200 ft.

$R = 200$ ohms tower footing resistance.

Then let us try

$N = 2$ counterpoise wires 200 ft. long each.

The surge impedance of the lightning stroke[4] may be taken as $Z = 400$ ohms. Then from Fig. 4:

$$\frac{1}{r} = \left(\frac{N}{R_3} + \frac{1}{R} + \frac{2}{Z_1}\right) = \frac{2}{40} + \frac{1}{200} + \frac{2}{500} = 0.059$$

$$\frac{1}{r} = \left(\frac{N}{Z_3} + \frac{1}{R} + \frac{2}{Z_1}\right) = \frac{2}{200} + \frac{1}{200} + \frac{2}{500} = 0.019$$

$$A = \left(\frac{1 + Z/r'}{1 + Z/r}\right) = \frac{1 + 400\text{x}0.059}{1 + 400\text{x}0.019} = 2.86$$

$$\sigma = \frac{R_3}{Z_3}\left(\frac{T}{6l}\right) = \frac{40}{200}\left(\frac{1{,}000}{6\text{x}200}\right) = 0.17$$

Therefore:

$f(\sigma, A) = 1.8$

[4] "The Lightning Stroke," by L. V. Bewley, *G.E. Review*, 1933.

and the maximum voltage on the tower top and on the ground wire is

$$e_{max} = \frac{2E}{1 + Z/r'} f(\sigma, A) = \frac{2 \times 15{,}000 \times 1.8}{24.6}$$

$$= 2{,}110 \text{ kv.}$$

This exceeds the permissible value of 1,815 kv., so let us try $N = 3$ counterpoise wires. Then:

$$\frac{1}{r'} = \frac{3}{40} + \frac{1}{200} + \frac{2}{500} = 0.084$$

$$\frac{1}{r} = \frac{3}{200} + \frac{1}{200} + \frac{2}{500} = 0.024$$

$$A = \frac{1 + 400 \times 0.084}{1 + 400 \times 0.024} = 3.26$$

$\sigma = 0.17$ as before

$f(\sigma, A) = 1.85$

$$\theta_{max} = \frac{2 \times 15{,}000 \times 1.85}{34.6} = 1{,}600 \text{ kv.}$$

This is less than the allowable tower top voltage, and therefore the three 200-ft. counterpoise wires radiating from the base of the tower at 120 deg. angles will provide the desired protection.

It is interesting to see the effect of the lightning wave front on the tower top voltage. This is illustrated below for the above example:

Wave Front	σ	$f(\sigma, A)$	θ_{max}
0.5	0.083	2.20	1,910
1.0	0.167	1.85	1,600
1.5	0.250	1.65	1,430
2.0	0.333	1.50	1,300
3.0	0.500	1.25	1,080
6.0	1.000	1.00	870

Isolating Radio Interference

How West Coast Utility Protects Its Commercial Radio Customers From Disturbances

By H. N. KALB

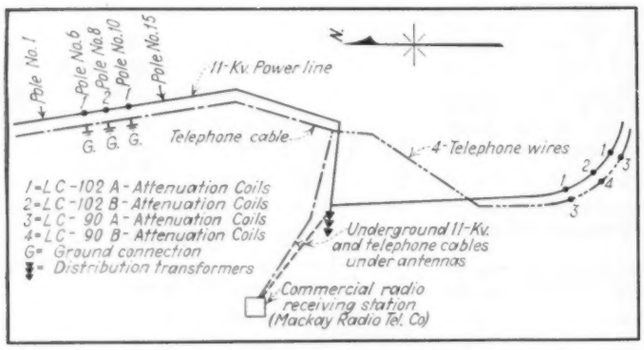
Pacific Gas & Electric Company, San Francisco, Calif.

COMMERCIAL radio-sending and receiving stations make a very desirable load for electric power companies, and the latter's present-day reliable service provides a most convenient and economical source of power. However, commercial radio-receiving stations must be assured of minimum interference. Location of the latter in out-of-the-way places, use of underground services thereto and sectionalization of power and telephone lines with attenuation coils in the proximity of such stations are methods of avoiding radio disturbances.

Of interest to all power companies and commercial radio companies should be the method of reducing radio interference to a minimum at a given location, without the big expense entailed in the past. This can be accomplished by inserting in each wire, near the area to be protected, the proper attenuation coils, and providing against the origination of any noise within the area to be protected. Such an installation at Lobitos, Calif., which has successfully prevented interference with the Mackay transpacific radio-receiving station, may be of general interest because similar installations can be used to prevent interference from entering any chosen location.

An 11-kv. power line passes by the receiving station, supplying power to the station, the small town of Lobitos and the various ranches in the vicinity. This power line is a constant potential source of radio interference, as any defect on the line, such as loose bond wires, tie wires, switchgear, fuse connections, noisy transformers, etc., will set up radio-frequency disturbances which will be carried along the line and cause interference for many miles.

It is not economically possible to work over the whole power line to prevent the occurrence of radio noise. This difficulty has been overcome by isolating a section of the power line in the vicinity of the radio station from radio interference existing in the remainder of the power line. This short section of power line was then worked over to insure tight bond and tie wires, good insulators, etc. This protected area extends about a mile in each direction from the radio station. All transformers within the protected area were equipped with especially designed choke coils in the high-voltage primary leads and condensers on the low-voltage secondary leads wherever the secondaries are long enough effectively to radiate interference. This arrangement prevents the radiation of interference in case any of the transformers should become noisy.



Power lines in proximity of Lobitos transpacific radio station

Effect of Chokes in Power Line on Radio Noise Field

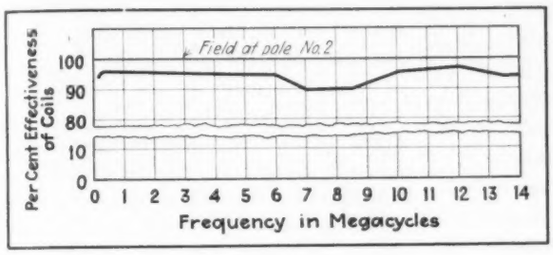
Lobitos, Calif.

Frequency (Kc.)	Noise Field in MV/M — Pole No. 2 Applied	Pole No. 2 Residual	Pole No. 15 Applied	Pole No. 15 Residual	Per Cent Reduction
870	335	...	17.0	*1.5	†95.5
4000	60	...	6.0	3.0	95
5000	84	2.1	10.6	5.3	94
6000	38	...	6.0	3.8	94.4
7000	94	...	11.9	2.1	89.6
8500	112	...	14.0	2.5	89.9
10000	170	1.3	10.6	2.1	95.0
12000	100	...	5.6	2.5	96.9
13500	89	...	7.9	2.0	93.7

*Noise on 879 kc. measured several spans further south.

†Actual reduction may be greater; high residual noise at this frequency obscures result.

Attenuation coils in power and telephone lines reduce spread of radio-frequency disturbances
Coils similar to the one shown are mounted on single insulators of the power pole.
Note protective gap placed across bakelite support at one end of coil.



Effect of power-line attenuation coils on radio-frequency disturbances
Shows per cent effectiveness with noise applied at pole No. 1 and readings taken at pole No. 15, coils being mounted on poles Nos. 6, 8 and 10.

This 2-mile section of power line was isolated from radio interference originating in the rest of the power line by the use of especially designed attenuation coils of very low inductance, designed and manufactured by the Radio Interference Specialty Company of San Francisco, Calif. These coils were placed, three in series, in each phase wire at each end of the protected area. The spacing of the coils along the line is important and depends on the constants of the power line and on the lowest frequency it is desired to stop. The effect of these coils on the 60-cycle power is negligible, three coils in series causing a voltage drop at full load equivalent to half a mile of power line. An impulse voltage of 2,000,000 volts was applied to these coils, with no damage resulting in the coil. In the Lobitos installation, where two sections of attenuation (that is, three coils in series) are used, the end coils are of lower inductance than the middle coils in each series of three. All of the attenuation coils used in the main 11-kv. power line have a continuous current rating of 100 amp.

At one end of the protected area a four-wire open telephone line paralleled the 11-kv. power line. It was necessary to place small attenuation coils, having the same characteristics as the power coils, in the telephone wires adjacent to the power attenuation coils to prevent the telephone line carrying radio noise into the protected area. At the other end of the protected area, where the telephone wires were in lead cable, the sheath was grounded adjacent to each power attenuation coil, thus effectively preventing the cable from passing interference by the power coils.

Results of tests

After the installation was completed two tests to determine its effectiveness were conducted. The first was a simple relative test in which a sensitive radio receiver was carried in an automobile along the power line and the difference in noise outside and inside the protected area noted. Outside the protected area the noise was so loud that it could be heard 300 ft. from the loud speaker. Inside the protected area no noise at all could be heard.

The second test was much more elaborate, being carried out by means of a telephone company field-strength measuring set. Readings were taken on nine different frequencies varying from 870 kc. to 13,500 kc. and the field strength at each frequency was read at fifteen different positions along the power line.

The curve made from the tabular data shows the per cent effectiveness of the attenuation coils. It should be noted that the curve is extremely flat over a very wide band of frequencies, which is the outstanding characteristic of the coils used in this installation. Actually this curve continues to points considerably below the broadcast range and above the short-wave bands. The Lobitos receiving station receives on frequencies ranging from 34 to 22,000 kc.

A Little Knowledge Is a Terrible Thing

Thermodynamics for City Hall.

To the Editor of The Sun—Sir: Mayor LaGuardia, in his fanciful proposal to the Consolidated Gas Company to reduce electric rates to the point that electricity will replace gas for cooking purposes, has asked the impossible.

The use of heat for any particular purpose involves the purchase of so many heat units. Whether it is desirable or economical to buy these heat units in the form of coal, gas, oil or electricity is a matter of simple calculation.

Unfortunately when electrical energy is converted into heat, the power consumed varies as the square of the current required. This means that to get twice as many heat units from gas involves only the purchase of twice as much gas, but to get twice as many heat units from electricity involves the purchase of four times as much electricity. F. M. H. Jr.

New York, January 15.

An editor often wishes he could give space to exploding popular fallacies about the merest rudiments of technology. The daily press and the popular magazines of science spread some devastating perversions of engineering truth. Here is one which should give a bit of a shudder to electrical engineers who are detailed to build up the load on the heat side.

With reasoning just as far wrong in the opposite direction the *Sun's* contributor might have used his square law to prove that twice as much electricity would afford four times as much heat; that would have given the gas salesman the jitters.

Appliance Merchandising in 1934

Last year in September and December "Electrical World" published statistical analyses of power company appliance merchandising on a national scale—first covering six months and then nine months of 1934 and 1933. This was an experiment to determine the feasibility of a regular periodic report on local appliance sales that would show what constitutes a good record in domestic load building. No such check-up on merchandising accomplishment and proficiency had been attempted in the industry before. Power company sales executives welcomed the idea and urged that the analysis be carried further to embrace local appliance sales by dealers wherever they can be estimated and indicate progress in load development. The first of these expanded surveys is now presented on pages 40 and 41. Similar tabulations will hereafter be published, semi-annually, in August covering six months' selling and in February covering the full year. Companies are arranged in four geographic groupings, but not identified.

POWER companies of the country have apparently broken all records in domestic load building in 1934—apparent because no figures on past performance are available. Almost without exception sales of appliances have increased greatly over 1933—sales both by utilities and by dealers—and evidence of many kinds show the selling operation both expanded and intensified.

Final figures are now in on appliance merchandising for the full year. Detailed reports have been submitted by more than a hundred power companies, serving 10,130,629 domestic consumers and therefore representing one-half the industry. These data on the sales of domestic equipment by these utilities appear on pages 40 and 41, together with their estimates of local dealer sales whose estimates could be provided. It compares last year's accomplishment with that of 1933 and the varying standards of performance which the figures indicate. Because it has been convenient to group certain systems on a single line, 100-odd operating companies appear in the tabulation as 75 reports. It embraces most of the important power companies of the country operating in cities of more than 25,000 population.

In the territories covered by these reporting companies the sales of electric refrigerators in 1934 showed an increase over 1933 of 25 per cent in sales by utilities and 28 per cent in sales by dealers. Electric range sales by utilities increased 109 per cent and by dealers 123 per cent. Electric water heater sales by utilities jumped 153 per cent and by the dealers 29 per cent. Clothes washer sales by the power companies went up 23 per cent and by dealers 50 per cent. Ironing machine sales were jumped by power companies 65 per cent and by the dealers 73 per cent. Utility vacuum cleaner sales increased 29 per cent and by the dealers 25 per cent. And sales of miscellaneous small appliances, including sewing machines, flatirons and the rest, increased 33 per cent by power companies and 26 per cent by the dealers. Some allowance must be made, however, for cases where more companies have reported sales in 1934 than in 1933, but the trend is indicated.

The dealer figures are, of course, based on incomplete knowledge. Only a few power companies which are not themselves merchandising appliances have set up any regular procedure for recording sales by dealers. But most companies can form a reasonable estimate, with the help of manufacturers, wholesalers and the dealers themselves. These estimates, therefore, give interesting evidence of the comparative volume of appliance sales by power companies and dealers. In this survey 63 companies estimated local dealer sales of refrigerators and 58 estimated on ranges. Fewer companies estimated on the other appliances, the lowest number being 35 companies on small appliances and 42 companies on cleaners. But these figures give a direct parallel embracing the merchandising volume in a great many communities and the proportion, in terms of units, are given in the table below.

It is interesting to note that in those areas where the power companies are actively merchandising, the dealers are selling more than three-quarters of all these appliances except ironing machines, of which they sell 68 per cent, and, of course, ranges and water heaters. These two appliances are in their pioneering stage and have not yet become staple merchandise, and the power company must build up popular acceptance before the dealer will find an active demand. The ironer itself is still being pioneered and the extent of the dealer sales shown here is gratifying.

The dollar total of appliance sales by the power companies listed in this tabulation has increased from $32,487,820 in 1933 to $44,316,101 in 1934, an increase of 36 per cent, with two more companies reporting. The total number of domestic consumers covered by these figures was up 3 per cent. The number of salesmen at work on domestic appliance load building increased from 3,840 to 4,264, or 10 per cent, with three more companies included. The expenditure for advertising applied to domestic appliance load building had grown from $2,798,224 to $3,818,162, or 36 per cent, with one more company reporting for 1934 than for 1933.

Behind these total figures lie some interesting comparisons. The average

Unit Sales of Domestic Appliances

Appliance	Power Co. Sales Per Cent	Dealer Sales Per Cent
Refrigerators	20	80
Ranges	74	26
Water heaters	84	16
Clothes washers	14	86
Ironing machines	32	68
Vacuum cleaners	16	84
Small appliances	21	79

appliance sales by power companies varied all the way from highs of $20.40, $19.35, $17.15, $15.90 and $15.75 per domestic consumer to lows of $1.76, $1.69, $1.26, and even one as low as $0.73. These are all companies that engage in merchandising for developing domestic load.

The average annual domestic consumption reported as of December 31, 1934, ranges all the way from lows of 363, 404, 429 and 454 kw.-hr. to highs of 754 and 766 in the Northeast, 825, 871 and 888 in the Southeast, 710 and 824 in the western Mississippi Valley and 1,015, 1,220, 1,236 and 1,610 kw.-hr. west of the Rockies. There were two outstanding increases over 1933 in average consumption—one of 26 per cent by a southeastern company and 14 per cent by a utility in the western valley. There were a number of increases of 10 per cent scattered through the Northeast, Southeast and between the Mississippi and the Rockies. But most of the companies showed only a few per cent increase.

The average revenue for domestic consumers also shows wide range from highs of $45.66 and $42.40 in the Northeast, $54.21 and $40 in the Southeast, $40.32 in the western valley and $48.45 on the coast, to lows of $27.97 and $26.99 in the Northeast, $27.22 in the Southeast, $29.32 and $29.50 in the western valley and one as low as $29.99 in the far West. Some 23 companies in the list show a loss in average revenue per domestic consumer, all due undoubtedly to rate reductions, as several point out.

Some striking increases in sales personnel are recorded. Three northeastern companies added 70, 51 and 28 salesmen, though five companies there show fewer on the sales force. One southeastern utility added 40 salesmen and another 37. One company on the coast added thirteen. There is still no agreement whatever among power companies as to the number of consumers that can be covered by a salesman in domestic appliance load building. In the Northeast they run from 583, 797 and 890 to 7,820, 11,250 and 25,938 consumers per salesman. In the Southeast there are lows of 678 and 942 and a high of 5,275. West of the Mississippi River they range from 650 and 839 to 8,921. And west of the Rocky Mountains we find lows of 708 and 1,315 and highs of 3,290, 4,700 and 5,578.

In advertising expenditures there were outstanding increases of 75, 100, 150 and 180 per cent in the Northeast, 130 and 90 per cent in the Southeast, 150, 160, 300 and 400 per cent in the western valley and two of 100 and one of 200 per cent on the coast. Here again there is no accord as to how much money should be spent per residence customer. The figure runs from 10, 12, 13 and 14 up to 59, 66 and 67 cents in the Northeast, from 30 and 33 cents to $1.41 and $1.45 in the Southeast, from 23, 24 and 45 cents to $1.15 and $1.17 in the western valley region and from 6, 25 and 39 cents to two at $1.13 on the Pacific Coast.

Out of the companies listed, 44 are operating a gas service, though some to but a small part of the field covered by the electric lines. These are indicated in the table, since this fact may well influence their rates for cooking and water heating. Of these companies in 1934 thirteen were renting electric ranges and ten were renting electric water heaters, against eight renting ranges and four renting water heaters in 1933. The total number of ranges put out on the rental basis by these companies was 7,107 in 1934 and 1,937 in 1933. They rented 2,542 water heaters in 1934 and 376 in 1933.

Reports were also received from eleven companies which do not merchandise appliances themselves. Their figures on average annual domestic consumption, average revenue per customer, advertising expenditures, etc., are shown in the small table. The highest annual consumption here is 1,210 in the Northwest. In the East the highest is 897, the lowest 481. No important increase was made last year. Average annual domestic revenue runs from $30.41 to $39.95. Advertising expenditure varies from 9 cents to $1.05 per domestic consumer.

In short, load and revenue do not differ greatly, nor advertising expenditure per customer, between the companies that merchandise and those that do not. Both are going forward very slowly, so slowly that at the present rate it will take ten to twenty years to double the present average domestic consumption. But the wide variation between the present performance of different companies in load building indicates that there is great opportunity for improvement in policy and method in many cities. The strongest single impression that comes out of a study of this tabulation is the lack of uniformity in the commercial practice among the power companies. Some sell electric ranges and water heaters and some do not. Some rent them and some do not. Some sell clothes washers, ironers, cleaners and small appliances and some do not. Some do not sell appliances at all. Some can estimate how many appliances the dealers are selling, but many have no definite knowledge of what their customers are buying and using. There is no agreement as to how many residence customers a salesman can serve or how much money should be spent per consumer in advertising to build domestic load. And so we find the gains in annual consumption running all the way from 2 or 3 to 10 per cent, with one of 14 and one of 26 per cent among these companies. Clearly there is need here for study and standards.

Where the Power Companies Sell No Appliances

Consumption, growth of load, average revenue and salesmen and advertising per consumer reported by a group of utilities that do not merchandise

Company	Domestic Consumers 1934	Domestic Consumers 1933	Av. Annual Dom. Consumption 1934	Av. Annual Dom. Consumption 1933	Av. Annual Dom. Revenue 1934	No. of Salesmen 1934	No. of Salesmen 1933	Advertising Expenditure 1934	Advertising Expenditure 1933	Advertising per Consumer 1934
1	90,614	85,443	602	554	$35.85	6	6	$40,000	$40,000	0.44
2	*9,719	9,211	671	633	38.58	....	....	6,333	3,421	0.65
3	*48,835	46,134	642	602	37.53	3	1	20,000	15,000	0.41
4	227,039	221,881	897	871	30.41	113	133	.....	.....	....
5	*54,625	53,203	693	636	39.95	11	10	40,410	37,784	0.74
6	640,000	630,000	481	463	30.48	55	55	.....	.....	....
7	*170,918	167,517	633	595	35.70	44	33	22,333	21,145	0.13
8	8,087	.....	496	....	35.53	2	....	700	.....	0.09
9	57,883	56,632	793	859	37.43	10	10	20,000	19,100	0.35
10	26,000	25,000	1,210	1,207	34.35	5	3	27,333	12,597	1.05
11	*72,000	72,900	643	612	35.10	11	8	26,000	24,000	0.36
Total	1,405,720	1,367,921	705	703	$35.53	260	259	203,109	173,047	0.47

*These companies also provide gas service in some parts of their territory.

Appliance Sales by Power Companies

Total sales of domestic appliances by more than 100 power companies for the full year 1934, together with their estimates of dealer sales in the same territory

Company	Power Co. Refrigerators Units Sold		Dealers Refrigerators Units Sold		Power Co. Ranges Units Sold		Dealers Ranges Units Sold		Power Co. Water Heaters Units Sold		Dealers Water Heaters Units Sold		Power Co. Clothes Washers Units Sold		Dealers Clothes Washers Units Sold		Power Co. Ironing Machines Units Sold		Dealers Ironing Mach. Units Sold		Power Co. Vacuum Cleaners Units Sold	
	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933
NORTHEAST—North of Ohio River, East of Mississippi River																						
1.	180	329	719	425	[2]229	190	123	90	[6]33	39	3	1	358	320	400	250	62	66	50	50	301	153
2.	2,349	2,644	1,800	2,000	[1]684	592	200	160	322	200	50	30	938	1,131	1,200	1,400	235	272	140	120	348	329
3.	137	206	726	955	[1]7	12	24	11	5	2	.....	.....	194	68	480	264	16	13	34	32	63	49
4.	361	205	.....	.....	[1]142	56	.....	.....	89	5	.....	.....	235	390	.....	.....	14	19	.....	.....	233	190
5.	865	799	3,000	2,500	[1]70	49	.....	.....	65	44	.....	.....	427	383	1,000	800	59	58	.....	.....	322	364
6.	4,187	3,002	.....	.....	[2]2,539	1,256	1,849	1,303	544	256	104	35	3,040	1,824	.....	.....	662	279	.....	.....	2,813	1,590
7.	3,091	3,066	7,500	6,209	[1]1,214	1,077	258	391	407	490	33	70	1,921	1,539	.....	.....	212	189	.....	.....	837	453
8.	2,336	1,927	10,000	8,000	847	123	100	85	123	10	7	4	1,378	1,009	8,000	6,000	493	212	250	100	988	825
9.	608	736	1,750	1,503	180	105	59	65	7	6	1	3	29	45	.....	.....	11	30	106	69	168	124
10.	603	857	850	900	[1]86	102	44	20	7	3	.....	.....	252	350	300	300	57	30	10	5	173	204
11.	993	459	1,130	748	[1]910	153	88	.....	35	14	7	.....	712	393	.....	.....	197	54	.....	.....	103	272
12.	4,442	4,555	38,514	42,567	[1]1,673	454	899	365	[6]878	95	114	79	3,516	1,799	87,900	44,975	685	259	1,370	518	1,907	1,498
13.	408	536	6,500	5,500	[2]55	.....	946	708	[2]50	.....	567	342	1,594	2,256	.....	.....	103	144	.....	.....	1,410	1,453
14.	1,131	929	19,000	12,000	[2]21	[3]10	116	15	17	10	2	1	959	1,060	4,000	4,300	166	116	900	700	2,413	1,646
15.	1,070	1,159	2,800	2,400	[1]114	94	50	40	13	3	.....	.....	250	274	3,000	2,500	72	89	250	200	79	45
16.	1,048	1,348	2,600	4,400	[1]327	138	40	15	119	18	.....	.....	644	543	2,500	2,000	118	57	100	75	838	1,010
17.	3,123	2,243	800	600	211	130	.....	.....	8	4	.....	.....	1,156	766	1,500	900	543	171	600	300	493	259
18.	5,609	5,588	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,149	3,803	.....	.....	1,261	598	.....	.....	4,463	3,101
19.	992	841	.....	.....	[2]2,950	[3]820	.....	.....	[6]26	33	.....	.....	980	909	.....	.....	364	190	.....	.....	860	453
20.	601	610	.....	.....	[1]351	154	.....	.....	15	6	.....	.....	833	651	.....	.....	235	51	.....	.....	310	215
21.	2,150	2,122	1,430	1,400	[1]3	5	.....	.....	.....	.....	.....	.....	241	233	160	156	61	51	40	35	250	345
22.	403	528	1,876	1,937	[1]152	65	54	57	29	12	10	13	.....	.....	3,150	3,111	15	32	133	169	.....	.....
23.	3,023	2,493	2,000	1,500	1,176	667	236	75	270	39	6	.....	1,979	1,085	1,000	750	621	225	400	150	1,158	626
24.	2,323	1,806	18,000	23,000	738	374	314	379	167	77	17	.....	2,013	1,571	.....	.....	372	235	.....	.....	1,251	1,136
25.	3,526	3,837	32,000	20,000	74	54	150	100	.....	.....	10	10	8,279	4,869	30,000	18,000	2,027	689	3,000	1,000	4,887	4,825
26.	1,403	1,927	2,225	2,254	[1]62	67	210	177	5	10	10	5	2,139	2,384	1,489	1,445	514	338	160	120	802	689
27.	1,050	713	1,000	700	[1]1,458	391	125	50	[6]113	[6]62	.....	.....	1,638	1,144	800	500	325	121	50	25	421	493
28.	1,798	1,319	.....	.....	[1]307	157	.....	.....	25	8	.....	.....	812	647	.....	.....	149	131	.....	.....	627	363
29.	3,117	4,076	.....	.....	[2]2,278	1,374	.....	.....	88	86	.....	.....	1,842	1,747	.....	.....	457	325	.....	.....	1,014	876
30.	451	468	1,550	1,500	[1]58	35	15	12	2	.....	.....	.....	490	522	760	650	50	52	20	16	623	422
31.	.....	.....	30,000	23,000	3,456	2,766	125	100	1,298	988	50	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
32.	1,749	1,678	.....	.....	[1]846	641	.....	.....	58	60	.....	.....	1,357	1,352	.....	.....	242	82	.....	.....	259	199
33.	1,808	1,318	.....	.....	[2]186	84	.....	.....	[6]12	5	.....	.....	2,049	2,059	.....	.....	609	442	.....	.....	1,485	1,329
34.	1,475	1,443	27,000	22,110	7	.....	30	25	.....	.....	.....	.....	2,714	2,697	22,600	22,000	865	626	7,200	5,200	1,990	1,593
35.	897	1,070	3,040	3,115	[1]334	225	137	86	57	61	6	3	.....	.....	.....	.....	55	54	144	108	.....	.....
SOUTHEAST—South of Ohio River, East of Mississippi River																						
36.	332	341	835	910	[1].....	101	20	11	45	21	.....	1	87	33	250	150	1	1	10	5	37	29
37.	4,254	2,385	3,065	1,160	[3]1,269	[3]318	262	10	[6]629	[6]86	67	.....	659	52	50	.....	81	9	5	.....	250	87
38.	424	333	2,109	1,267	80	.....	17	.....	4	1	1	.....	52	19	1,100	300	10	.....	75	10	376	355
39.	10,428	3,619	10,572	4,661	[7]3,577	[3]652	10	5	[6]1,896	[6]117	4	2	911	237	2,500	1,500	314	40	200	150	518	453
40.	1,076	978	3,100	2,750	[1]99	22	2	.....	6	.....	.....	.....	9	137	4,500	3,650	203	114	140	75	16	16
41.	2,148	2,072	1,200	1,000	1,293	582	50	30	555	117	20	5	454	20	40	25	17	3	10	5	228	118
42.	188	274	7,130	6,982	710	667	462	355	222	254	71	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
43.	555	677	9,011	3,983	[1]1,309	396	1,471	649	829	366	750	314	104	91	.....	.....	18	17	.....	.....	63	104
44.	7,832	1,600	6,000	3,500	[3]3,810	1,079	399	100	[6]1,762	394	53	10	493	340	.....	.....	30	23	.....	.....	522	376
CENTRAL—West of Mississippi River, East of Rocky Mountains																						
45.	38	.....	1,457	1,454	[1]180	.....	58	31	34	.....	1	.....	143	.....	1,467	1,594	133	.....	74	41	.....	.....
46.	1	3	5,372	4,758	9	32	22	20	11	2	.....	.....	5	10	1,356	1,100	6	10	120	95	29	294
47.	49	58	75	100	[1].....	.....	.....	.....	.....	.....	.....	.....	106	132	75	60	3	7	25	15	80	135
48.	74	.....	4,985	3,563	85	.....	65	56	2	.....	3	2	4	.....	4,828	3,501	2	.....	438	184	17	.....
49.	1,150	750	7,700	5,500	20	20	12	12	6	3	.....	.....	40	80	1,600	1,300	10	20	50	30	525	185
50.	314	365	836	138	[1]55	49	23	33	9	6	24	32	247	98	400	200	3	.....	30	10	114	32
51.	1,000	768	1,024	790	[3]142	37	8	5	1	1	3	2	286	310	270	290	41	27	34	19	413	263
52.	318	262	1,714	1,713	[1].....	.....	.....	.....	.....	.....	.....	.....	576	187	4,526	2,361	8	4	95	66	525	514
53.	2,194	2,475	10,738	8,525	[1]1,904	640	330	158	1,405	100	1,230	.....	1,078	1,659	10,822	9,975	266	348	1,340	1,090	1,344	1,557
54.	976	766	.....	.....	[3]46	[3]52	.....	.....	.....	.....	.....	.....	237	233	.....	.....	3	5	.....	.....	147	180
55.	213	165	645	541	[3]560	[3]219	15	44	[6]475	[6]299	3	9	45	29	.....	.....	3	6	.....	.....	79	51
56.	157	154	473	559	189	138	77	111	24	.....	2	4	260	232	1,103	761	87	74	72	63	256	68
57.	1,283	745	2,261	1,453	[3]772	[3]169	10	9	263	22	.....	.....	166	120	1,000	750	3	2	.....	.....	125	239
58.	1,026	388	3,437	.....	340	24	19	.....	109	7	2	.....	440	173	600	.....	35	23	20	.....	271	261
59.	262	260	931	900	[1]250	91	15	10	71	13	5	.....	266	299	2,098	1,850	52	24	90	45	.....	.....
60.	2,472	2,549	1,019	700	[1]610	574	20	15	612	931	1	.....	1,449	2,199	652	300	201	435	49	10	283	436
61.	1,125	1,026	29,041	20,821	[1]310	145	320	35	104	10[2]	.....	.....	504	366	.....	.....	240	129	.....	.....	1,596	1,464
62.	1,803	1,060	18,000	10,000	[3]323	200	50	50	[6]38	3	.....	.....	918	1,287	.....	.....	642	840	.....	.....	191	203
WESTERN—West of Rocky Mountains																						
63.	1,232	1,152	2,893	.....	912	596	438	.....	92	74	7	.....	411	258	4,698	.....	74	39	228	.....	764	513
64.	.....	.....	24,275	17,131	[1]1,150	1,273	1,329	1,651	1,878	791	476	664	.....	.....	26,377	19,943	.....	.....	6,189	3,828	20,316	13,695
65.	681	522	4,557	3,207	[1].....	.....	1,212	1,006	.....	.....	634	449	366	189	5,632	4,024	80	38	730	599	237	210
66.	635	295	1,728	1,514	486	158	251	128	376	147	144	94	1,050	665	2,475	1,275	266	84	99	69	180	186
67.	316	201	700	500	[3]397	67	20	.....	58	38	.....	.....	284	202	400	300	30	27	.....	.....	163	106
68.	553	350	1,819	754	811	385	475	233	383	327	.....	.....	730	384	2,855	1,585	116	79	75	.....	207	288
69.	235	140	3,500	3,300	[1]170	53	229	60	19	20	32	32	219	213	4,000	3,000	81	101	485	250	272	361
70.	1,569	1,088	.....	.....	[1]374	395	.....	.....	10	5	.....	.....	553	528	.....	.....	104	99	.....	.....	361	279
71.	462	323	3,027	1,612	375	218	186	158	844	151	52	66	641	469	3,900	3,500	321	248	200	75	684	414
72.	1,223	1,055	.....	.....	[1]196	156	.....	.....	17	7	.....	.....	1,013	1,138	.....	.....	209	309	.....	.....	1,067	901
73.	552	308	6,500	4,300	818	408	665	600	708	241	15	25	432	213	7,300	4,900	145	42	750	100	213	138
74.	552	335	3,642	2,869	[1]1,297	817	478	1,428	847	306	301	642	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
75.†	581	489	3,472	2,215	272	199	35	12	60	41	1	.....	499	448	3,770	2,191	77	45	232	117	413	309
Total	109,590	87,168	406,653	316,353	48,945	23,352	15,247	11,354	19,296	7,639	3,899	3,019	64,895	52,873	270,883	180,686	15,842	9,572	26,822	15,943	66,771	51,950

†Mass totals of four additional companies. [1]Operate a gas service. [2]Commenced selling November, 1934.

and Dealers for the Full Year 1934

Comparisons of these sales totals with 1933—Embracing more than ten million domestic consumers—With data on average consumption, revenue, appliance sales, salesmen and advertising expenditure

Dealers Vacuum Cleaners Units Sold		Power Co. Small Appliances Units Sold		Dealers Small Appl. Units Sold		Total Sales of Appliances by Power Co.		Appl. Sales per Customer	Total Domestic Consumers	Av. Annual Domestic Kw.-Hr. Consumption		Av. Revenue per Customer	Power Co. Salesmen		Consumers Per Salesman	Power Co. Advertising Expenditure		Advertising per Consumer	Company
1934	1933	1934	1933	1934	1933	1934	1933	1934	1934	1934	1933	1934	1934	1933	1934	1934	1933	1934	
NORTHEAST—North of the Ohio River, East of the Mississippi River																			
175	75	3,826	3,917	956	980	$133,708	$142,267	5.12	26,083	607	583	$36.84	15	15	1,738	$9,501	$9,862	$0.36	1.
700	600	21,854	16,834	18,000	15,000	966,523	917,264	7.65	126,665	687	654	40.95	76	71	1,665	47,900	32,350	0.38	2.
250	200	901	700	1,600	1,400	59,387	60,448	1.69	35,143	363	355	21.78	7	7	5,020	3,500	4,000	0.10	3.
.....	.....	2,198	1,892	.....	.....	165,770	113,053	5.07	32,674	475	455	31.21	14	14	2,330	9,683	3,404	0.31	4.
.....	.....	.....	.....	.....	.....	281,466	236,143	2.80	102,000	562	540	31.87	40	35	2,550	12,000	10,000	0.12	5.
.....	.....	12,601	9,071	.....	.....	1,695,199	1,005,252	6.10	278,357	665	632	27.97	190	139	1,465	126,133	92,009	0.45	6.
.....	.....	14,019	14,666	.....	.....	1,503,978	1,164,208	5.09	295,793	530	503	35.75	201	185	1,472	108,731	95,422	0.34	7.
7,000	5,000	19,780	16,617	70,000	58,000	1,170,000	803,000	7.95	147,371	704	661	33.60	126	98	1,170	83,500	34,500	0.57	8.
.....	.....	1,844	2,141	.....	.....	168,307	168,628	4.40	37,951	603	569	38.54	20	19	1,892	7,353	7,169	0.14	9.
200	200	13,457	4,010	4,000	4,000	214,532	249,555	5.35	40,461	404	388	32.16	18	18	2,248	5,166	6,976	0.13	10.
.....	.....	3,415	3,189	.....	.....	57,835	23,162	1.26	46,099	483	446	37.08	24	16	1,918	9,917	9,105	0.21	11.
27,240	21,400	21,962	18,071	439,240	361,420	2,004,500	1,509,950	3.75	533,123	675	645	34.30	190	188	2,800	227,471	187,440	0.43	12.
.....	.....	20,000	15,000	.....	.....	506,252	539,880	2.56	197,706	707	637	30.05	50	60	988	67,000	74,000	0.34	13.
10,000	8,000	60,500	49,700	250,000	200,000	608,760	525,698	3.12	194,737	656	617	27.55	78	77	2,495	129,854	61,781	0.67	14.
1,500	1,200	3,481	2,247	10,000	8,000	296,476	227,983	3.11	95,400	553	529	33.03	12	12	7,820	39,365	37,384	0.41	15.
4,000	5,000	2,631	2,317	18,000	15,000	582,485	569,528	7.50	77,705	615	584	45.66	31	27	2,510	44,390	39,653	0.57	16.
1,000	700	4,804	4,685	6,000	5,000	1,161,914	741,739	17.15	67,831	647	621	38.26	85	80	797	40,370	33,874	0.59	17.
.....	.....	118,316	106,787	.....	.....	3,410,535	2,836,502	4.46	764,613	766	740	33.69	517	578	1,375	432,451	368,770	0.57	18.
.....	.....	32,823	22,009	.....	.....	707,952	374,677	1.48	476,896	719	694	28.99	18	24	25,938	84,140	111,250	0.18	19.
.....	.....	5,750	5,129	.....	.....	373,655	281,246	9.50	39,347	548	538	32.11	10	6	3,935	26,000	19,000	0.66	20.
165	230	1,500	2,000	1,330	1,330	448,297	443,498	4.90	91,283	620	585	42.40	30	30	3,040	.....	.....	.....	21.
1,955	1,673	.....	.....	.....	.....	145,463	140,723	3.12	46,608	542	522	38.94	20	20	2,325	14,496	13,859	0.31	22.
1,200	750	8,785	7,939	9,000	8,000	1,249,854	753,856	8.00	155,781	664	633	31.21	175	105	890	86,223	54,503	0.55	23.
.....	.....	25,597	21,970	.....	.....	951,024	697,480	3.09	316,008	626	605	35.48	28	18	11,250	144,328	83,511	0.46	24.
25,000	23,000	51,577	48,070	250,000	225,000	2,177,122	1,805,593	2.83	713,621	520	500	36.80	230	215	3,095	.....	.....	.....	25.
883	848	7,692	7,701	11,398	11,437	599,320	668,221	3.80	156,633	482	465	34.73	58	56	2,700	24,988	29,963	0.16	26.
200	150	.....	.....	.....	.....	630,340	421,381	9.80	64,295	506	478	32.17	30	30	2,140	22,980	14,651	0.36	27.
.....	.....	5,500	4,349	.....	.....	520,467	368,973	3.82	136,248	454	425	26.99	55	49	2,480	33,900	27,504	0.25	28.
.....	.....	18,109	17,892	.....	.....	1,292,511	1,329,501	3.20	403,906	486	459	32.09	132	134	3,060	.....	.....	.....	29.
500	400	3,570	3,334	.....	.....	308,500	270,988	10.01	29,812	619	553	38.74	23	23	1,295	11,388	10,205	0.38	30.
.....	.....	.....	.....	.....	.....	647,534	568,519	11.80	547,986	575	539	32.58	120	120	4,560	89,000	60,000	0.16	31.
.....	.....	6,600	4,394	.....	.....	750,000	600,000	15.15	49,588	587	543	35.41	85	79	583	21,500	14,500	0.44	32.
.....	.....	46,925	38,114	.....	.....	782,649	716,195	3.37	232,446	643	621	37.99	61	80	3,800	91,000	80,000	0.39	33.
20,000	6,000	18,561	14,237	154,700	118,600	862,479	829,421	3.09	279,611	754	730	34.54	71	64	3,925	40,750	37,900	0.15	34.
.....	.....	.....	.....	.....	.....	329,258	367,654	3.22	102,281	457	443	31.37	25	30	4,071	23,445	18,332	0.24	35.
SOUTHEAST—South of Ohio River, East of Mississippi River																			
250	219	2,352	1,556	2,600	1,500	169,200	130,300	5.65	28,903	501	492	36.91	10	10	2,890	21,000	16,120	0.76	36.
.....	.....	15,528	5,585	.....	.....	1,107,351	615,159	15.90	69,368	871	792	33.44	30	25	2,300	22,614	18,553	0.33	37.
100	100	10,206	7,270	7,500	6,000	262,027	137,221	5.15	50,879	521	493	27.22	37	27	1,372	35,062	9,134	0.69	38.
3,000	2,000	50,263	22,875	18,000	15,000	2,448,462	1,108,305	20.40	120,033	888	803	35.53	177	140	678	140,000	87,000	1.17	39.
1,300	975	5,708	4,146	6,500	5,100	398,496	324,742	6.08	65,537	578	544	32.63	25	25	2,610	23,092	10,719	0.35	40.
500	400	7,308	5,194	.....	.....	832,393	552,100	15.75	52,715	680	659	40.00	29	30	1,820	.....	.....	.....	41.
.....	.....	.....	.....	.....	.....	176,160	179,550	1.76	100,724	825	756	39.96	19	19	5,275	30,000	35,000	0.30	42.
.....	.....	16,897	3,239	.....	.....	442,534	273,585	6.57	67,430	797	751	54.21	45	40	1,492	95,000	88,000	1.41	43.
.....	.....	35,458	15,188	.....	.....	1,824,857	676,878	19.35	94,271	774	612	31.96	100	60	942	137,000	76,000	1.45	44.
CENTRAL—West of Mississippi River, East of Rocky Mountains																			
.....	.....	.....	.....	.....	.....	69,228	.....	3.45	20,483	517	483	31.17	7	.....	2,929	4,843	1,288	0.24	45.
439	400	10,331	7,020	35,800	30,000	90,076	83,528	1.52	59,464	663	626	33.49	9	9	6,607	38,111	27,373	0.64	46.
100	100	439	251	200	200	42,044	31,863	7.40	5,686	458	402	29.50	4	5	1,421	3,521	2,367	0.62	47.
1,488	1,225	388	.....	22,301	18,423	89,788	.....	1.76	51,870	637	582	31.51	8	.....	6,483	26,842	6,276	0.52	48.
1,300	900	16,000	14,000	40,000	35,000	400,000	280,000	4.60	87,000	618	493	30.00	25	20	3,480	40,000	30,000	0.46	49.
250	150	2,331	757	.....	.....	115,920	92,848	6.02	19,229	500	486	36.32	14	13	1,370	22,068	654	1.15	50.
390	210	1,626	1,110	2,430	1,560	276,000	181,044	14.75	18,707	660	615	35.33	12	10	1,555	13,462	10,987	0.72	51.
281	296	11,455	13,637	14,744	5,038	251,312	169,644	3.55	70,685	478	457	36.47	30	20	2,360	57,594	45,911	0.82	52.
4,705	4,500	25,923	14,738	93,570	60,000	894,091	632,925	2.98	300,690	609	587	33.96	101	86	2,980	68,311	26,354	0.23	53.
.....	.....	1,229	1,235	.....	.....	263,170	204,296	10.80	24,306	429	406	29.93	12	12	2,025	18,296	14,000	0.75	54.
.....	.....	2,294	2,076	.....	.....	150,086	65,294	9.20	16,362	710	612	34.15	10	10	1,636	16,602	14,257	1.02	55.
331	273	7,467	2,096	5,531	4,562	123,220	79,423	3.48	35,433	652	638	31.78	33	22	1,070	41,353	31,858	1.17	56.
250	175	5,830	4,429	4,000	3,000	391,479	260,562	11.25	34,690	659	613	41.29	28	28	1,235	30,000	25,000	0.87	57.
.....	.....	.....	.....	.....	.....	378,931	174,594	8.60	44,233	552	494	36.72	30	27	1,470	34,713	13,628	0.78	58.
.....	.....	.....	.....	.....	.....	146,354	102,249	6.63	22,108	544	517	34.11	25	22	885	9,910	6,556	0.45	59.
.....	.....	10,972	8,044	.....	.....	826,004	813,500	2.62	31,683	713	617	40.32	49	51	650	.....	.....	.....	60.
.....	.....	36,025	29,244	.....	.....	33% increase ov. 1933		.....	245,014	824	754	.....	120	106	2,040	145,465	109,131	0.60	61.
.....	.....	21,253	18,250	.....	.....	.....	.....	.....	93,000	732	698	.....	40	30	2,320	100,000	.....	1.07	62.
WESTERN—West of Rocky Mountains																			
3,794	.....	.....	.....	36,808	.....	565,092	382,077	6.30	89,741	716	705	35.12	39	36	2,300	75,000	50,000	0.84	63.
.....	.....	.....	.....	.....	7,133	.....	.....	.....	527,185	726	733	32.57	.....	.....	.....	140,000	145,839	.....	64.
3,565	3,271	8,265	6,068	66,948	53,578	266,380	193,740	3.69	72,055	972	912	39.06	37	33	1,945	18,204	6,708	0.25	65.
554	321	.....	.....	.....	.....	349,141	187,036	8.08	43,482	1,236	1,230	37.00	27	18	1,605	34,800	19,547	0.78	66.
150	100	3,648	2,005	3,000	2,000	138,543	94,148	7.05	19,787	580	562	34.81	15	12	1,315	3,203	3,568	0.06	67.
400	364	2,689	2,500	5,270	4,400	321,120	187,391	8.80	36,525	1,220	1,250	48.45	51	38	708	21,243	10,163	0.58	68.
1,400	1,000	7,200	6,900	22,960	20,000	139,970	112,239	2.27	61,365	600	624	31.20	11	10	5,578	.....	.....	.....	69.
.....	.....	9,170	4,255	.....	.....	550,560	356,952	10.15	54,557	706	707	33.95	37	23	1,470	45,258	24,330	0.83	70.
1,800	1,200	5,099	2,431	27,050	14,500	356,658	194,902	6.95	51,453	1,610	1,646	37.36	19	15	2,700	58,071	37,511	1.13	71.
.....	.....	12,738	9,539	.....	.....	648,180	530,031	6.49	100,793	502	473	29.99	60	55	1,675	76,283	77,461	0.76	72.
4,900	3,300	5,305	2,984	49,500	33,000	402,672	203,619	4.05	99,209	1,015	1,014	30.95	30	20	3,290	38,477	22,526	0.39	73.
.....	.....	.....	.....	.....	.....	383,927	256,182	2.72	141,507	993	997	31.02	30	.....	4,700	.....	.....	.....	74.
1,677	826	4,202	1,528	7,496	4,042	260,623	207,707	4.31	60,405	571	545	33.94	14	11	4,130	14,341	10,528	0.51	75.†
134,892	107,731	914,177	689,132	1,715,832	1,357,203	44,316,101	32,487,820	[4]4.38	10,130,629	[6]655	[5]622	[5]34.57	4,264	3,840	[4]2,375	3,818,162	2,798,224	[4]0.38	Total

[3]Rent ranges. [4]Weighted average. [5]Straight line average. [6]Rent water heaters. [7]Operate a gas service and rent ranges.

One of a Series of Intimate Talks with Industry Executives

Wishon Talks About Rates

An Interview by

C. W. LEIHY

WHENEVER two or more utility men get together these days one of the first questions asked is, "What are you doing about rates?" So it is little wonder that, despite all the published information on the subject, some two hundred utilities and regulatory bodies have written San Joaquin Light & Power Corporation for intimate details of its original "free electricity" plan, the subsequent "inducement offer" and later "half-off" program. All of these rate developments have taken place within a year, and to understand their frequency, significance and success one must appreciate the dynamic personality and homely philosophy of A. Emory Wishon, president of San Joaquin Power. Emory Wishon has grown up in the power business, son of a pioneer who envisioned the building of an empire in the San Joaquin Valley along with the construction of a power system. There is a story he tells of his father which has affected his whole career and which explains much of his success. He had just been appointed to his first executive post—division manager—when one day his father asked him: "Son, what is the most important element in utility management?"

Without hesitation he replied: "To earn dividends for the stockholder."

"You're wrong," his father said. "Try again."

"To render good service," he stated after some thought.

"That's only part of it. Sleep on it and give me the answer in the morning." He was no closer the next day, so his father answered the question for him in these words: "The most important element of management—and I don't want you ever to forget it—is to keep the customer satisfied."

This story kept running through my mind as he talked about rates. "Speaking of rates, no one ever saw a kilowatt-hour, yet the public has paid for billions of them. When a merchant sells you a sack of potatoes he talks about the potatoes and not the sack; when he sells you a gallon of whisky he talks about the whisky, not the gallon. We have talked too long about rates and kilowatt-hours, rather than the cost and value of service. Whether it is the electric business, the peanut business or the hat business, the price charged for a commodity must at least pay the cost of doing business, if the business is to continue. This is one yardstick that is universally correct.

"Determining the price to be charged for electric service under widely varying conditions is a complex and technical job. You can make two schedules, each of which will bring in the same return. One of them will create ill-will and suspicion; the other will win good will and create business. Rate engineers can determine a rate that is empirically and theoretically right on the basis of return to the company and a fair charge to the customer, but it also must be psychologically right to the customer. Rate engineers are not always psychologists. Also, psychologists are not always able to figure rates that will be fair to the company and satisfactory to the customer.

"The customer is not interested in ohms, amperes, watts, corona, harmonics or impedance. He is, or should be, interested in lamps, washing machines, refrigerators, mangles, space heaters, electric ranges and a hundred and one labor-saving, comfort-giving, electrical gadgets; things that he can see, feel, use and enjoy. He knows dollars and cents. Tell him how many cents it will cost per day to run that refrigerator or to keep his wife off the washboard. He is not as dumb as we are.

Here I interjected a question about the laboratory experiments in rates that San Joaquin Light & Power Corporation had been conducting.

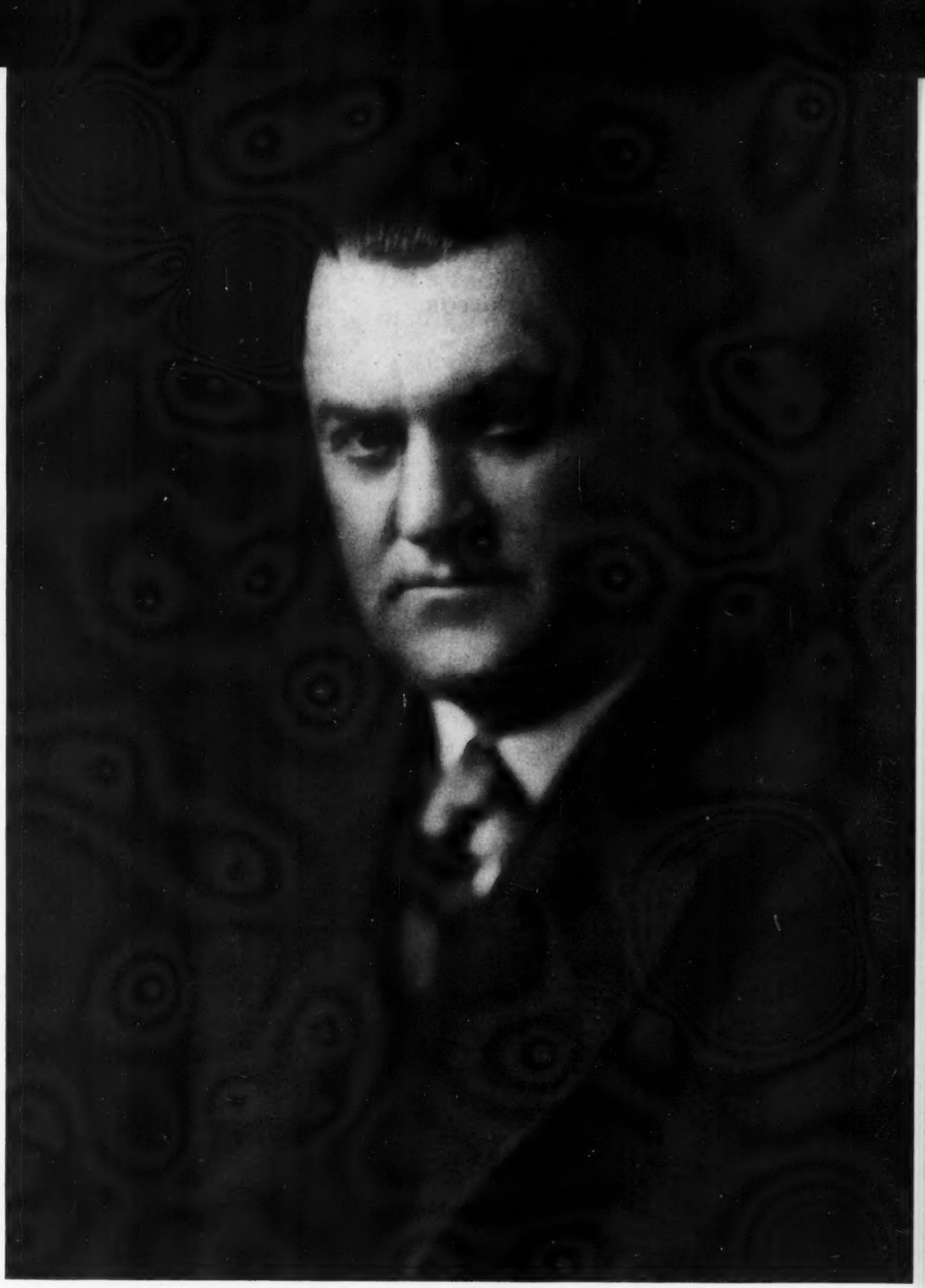
"In our own case we figured that first of all our experiment must assure us the cost of doing business. Loss of load during the depression left us with a surplus in production, transmission and distribution plant. The mass psychology for economies had curtailed use of our commodity by thousands upon thousands of our customers.

"We wanted to break the habit of non-use; to put the current-consuming devices back into service. We had facilities to do this without great additional expense. We first offered 'free electricity' to all domestic and commercial consumers for all electricity consumed per month for April and May over the amount consumed for March. For agricultural pumping we offered all additional electricity used for April and May as compared to the same months the year previous at one-half the regular price. We didn't confuse the customer by technical rates. We advertised in newspapers, on billboards, by radio, direct mail and personal calls. Manufacturers, jobbers and dealers helped.

"Newspapers, poster boards, special show windows, banners, broadsides, cooking schools, classes in home lighting, specialists in commercial lighting and traveling kitchen coaches told our story. One electrical show in a town of 65,000 people had 35,700 in attendance in a three-day stand. We ballyhooed in simple terms that the people might understand what we had to offer. We got results. The customer got a lot more service and was happy. Old appliances came off the shelves, and new appliance sales jumped several hundred per cent, compared to the same period the previous year.

"Then followed the 'inducement offer' and the 'half-off' offer. The program and the results were about the same. The habit of non-use was broken. A still greater use was a comparatively easy sale when we told our story in the merchant's language.

"The greater the use of facilities the quicker we can make further rate reductions. We must build load. We must sell."



A. EMORY WISHON, president of the San Joaquin Light & Power Corporation, is an enterprising utility executive who bases his management policies on getting satisfied customers to use more electricity. He does not hesitate to depart from beaten paths to accomplish these objectives.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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T.V.A. Strikes a Snag

WHETHER the T.V.A. competition with regulated private industries within the confines of a state is within the Constitution now will get the ultimate judicial test it deserves. Judge Grubb's decision in the suit brought by the preferred-stock holders of Alabama Power Company to question the legality of sale of properties to T.V.A. is that T.V.A. is engaging in activities beyond its legal authority when it manifestly intends to make the direct sale of power superior to the weakly associated program of flood, erosion and navigation control. Likewise, P.W.A. may be conforming to the Constitution in lending money to the municipalities, but when that money is earmarked specifically to build electric systems it is wrong. The court holds it illegal to advance funds for an enterprise which in itself is illegal, and therefore permanently enjoins the towns from accepting these funds for those particular purposes.

The issue of private versus government operation will be squarely joined in the review which the United States Supreme Court will have to give to this decision when the announced appeal brings it to its door. If the ruling is adverse there is already talk of starting a constitutional amendment on its long rounds so that the public ownership fanatics can have a clear path. But around T.V.A. offices the sentiment is reported to be less cocksure. Their profession of purity of intent in tacking river control onto power control, followed by unprecedented propagandizing for "yardsticks," has been too much like denying that the cur's long tail explains the wagging. As Ben Jonson said in his Catiline, "The dignity of truth is lost with much protesting." The undignified scramble to get the government into business in a big way has received at least a temporary check.

No forward-looking person will object to the government harnessing our streams so that our soil, our forests and our interior navigation network will be so safeguarded as to protect our economic future. But there never was any excuse for perverting this worthy cause into a subsidized competitive assault on an industry over which local government exercises more control than it does over any other. Now the country is entitled to know whether it will continue to be chicaned into helplessness by bureaucracy or whether unimpassioned deliberation will not disclose that the Constitution shall reclaim its place on the pedestal where all the world has been wont to revere and emulate it as a charter of freedom.

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Fresh Starting Points

AS has been so well stated by Dr. Whitney, no one dares to say what electricity may do in the future. Discoveries and inventions are not terminals; they are merely fresh starting points. It is equally true that electrical applications are not finished. They afford the base upon which to build business.

Electric lighting is just coming into its own. The science of seeing opens new horizons, the neon and other gaseous lights still afford promises of overcoming the inefficiency of the resistance filament lamp and offer splendid aids to architectural, decorative, sign and traffic lighting. The built-in lighting is an indication of the evolution of light and its embodiment in architecture as a primary element. Our streets and highways, offices and homes are crude examples of the lighting of the future.

And when we glance at the possibilities of home electrification we are staggered at the magnitude of the market. Air conditioning, off-peak house heating, hot water heating, electric cooking, television, the photocell applications, the small appliances, the lights and controls. There is a $15,000,000,000 market that will be sold, and if sold will stimulate an expansion in durable goods that staggers the imagination. The equipment is almost perfected, the sales knowledge exists and the electrical industry is ready to start on this task on a scale that is fully warranted by the business prospects.

In general industry there is an equal opportunity for electrification, for improvement, for new devices and for more applications. The motor and electric light are simply steppingstones to mount upon. Electric furnaces, electric heat and electric welding cut costs and speed fabrication. The electrical controls, instruments, tubes and photocells automatize production and introduce precision and flexibility. Electrochemists, with their new platings, are now bringing out electrodeposition of non-metals, are producing synthetic products ranging from building materials to rare jewels. They are remodeling practices in all lines of production from ceramic, to paints, to lacquers, to automotive, to boilers. In building construction and materials there is a startling evolution going on in material and practice. And yet some think we have

reached a terminal point in the movement toward industrial electrification.

But there are other markets. Look at transportation on land, water and air—the new things are electrical. In communication the surface is only scratched in television, radio, telegraph and telephone. In power supply, from d.c. transmission to a house service, all apparatus and all methods are threatened with change because the genii of electricity are hard at work doing new things. Electrical men are proud of their records in the past, but now is the time to get the vision of Dr. Whitney and look ahead. No one dares to place limits upon what electricity will do in the future.

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Keep Voltage Abreast of User Psychology

UNELECTRIFIED minds have queer ways of expressing things when they lack the jargon of the technical man. Thus, a newcomer said to the utility manager: "Your service is bad. Why, I can't toast my bread as fast as I can eat it. That wasn't true where I came from." That was merely his eloquent way of saying that a voltage survey was probably needed. Voltage drops and the need for regulation mean nothing to him, but he has his conscious reactions to the results.

Voltage regulation is undoubtedly better than it ever has been. Many companies are diligent in running down the causes of low voltage and correcting them. Even then there are still sections that have not been explored as thoroughly as others. In addition, there are those properties on which the job is put off to another year. There seems to be no worse way of courting unfavorable customer opinion, unless it be the toleration of intolerable service interruptions. Users are progressively more informed on what kind of service they need in order to derive satisfaction from the appliances they rely upon. Little appliances have their little annoyances if voltage is poorly regulated, but the bigger appliances have bigger annoyances. Any one planning a range program realizes this and is shortsighted if he does not act on it.

Voltage regulation is an economic-engineering problem. It is not a guess installation of regulators, boosters and transformers, nor is it necessarily the correct answer to increase wire sizes, extend three-phase feeders, redistribute or change the size of transformers. A voltage survey in each area should be followed by an economic and engineering analysis. Then the money spent for regulation can be apportioned intelligently. After this comes the check to see if results correspond to calculations. One system recently found voltages ranging from 85 to 130 in spots where it was thought conditions were satisfactory. Not many will be as bad as that, but instances where the departure from normal is half as much will be found to be not so few if they are searched. The customer is interested in continuity or quality of his kilowatt-hours.

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Let's Look the Facts in the Face

A LITTLE STUDY of the analysis of domestic load building for the year 1934, presented in this issue, indicates that there are important changes coming in commercial policy and practice in the power industry. As in every great emergency, men will discover how to do things long looked on as impossible. Under pressure of need the barriers will be broken down, traditions will be brushed asunder and the way found.

Two points stand out. First, the growth of domestic load in most systems is so slow that it would take fifteen to twenty years at the present rate to double the present 630 kilowatt-hours of average consumption. And, second, most companies that are actively merchandising appliances are making no better progress than those companies that sell no appliances. Yet if complete and universal household electrification is to be achieved in response to the present demand, this is no progress at all. For to make headway, there should be an average domestic consumption of 1,500 to 2,000 kilowatt-hours in the next three or four years. And this is beyond the hope of present practice.

The similar records of both utilities that do and do not merchandise does not argue that power company appliance selling is not worth while. Rather, it shows that neither those companies that actively merchandise nor those that restrict themselves to promoting sales through dealers are now doing enough to build domestic load. The question is, What more can be done both in direct selling and the development of dealer sales? And if residence rates are to continue to come down and open the door for electric cooking, water heating and air conditioning and the more liberal use of all the other appliances the answer must be found.

Increased direct sales of appliances by the power companies undoubtedly lie in the direction of greater man-power, more liberal customer financing, larger appropriations for advertising and better organization and planning. Increased sales through dealer outlets must be developed by more creative co-operation with the local trade—by any method that will build load profitably—perhaps by paying cash commissions on the load value of all appliances sold. These statistics show that the dealers do the bulk of the business and therefore represent the greatest opportunity.

But that is not all. At present too many power companies lack a balanced program that promotes an increased use of all appliances, adequately supported by sales personnel and advertising. Look at the figures. Here lies the weakness and here much progress will soon be made.

Rayburn Bill Hearings Open

Dr. W. M. Splawn outlines report on holding company investigation before House interstate and foreign commerce committee — Judge Robert E. Healy also testifies — Utility executives assail bill

Hearings on the Rayburn holding company bill opened before the House interstate and foreign commerce committee last week. Testimony by Dr. W. M. Splawn, member of the Interstate Commerce Commission, who has acted as counsel to the House committee in its holding company investigation, consumed the entire opening session.

Dr. Splawn presented an outline of the several types of holding company structures as he had classified them, praised the great degree of co-operation shown the investigators almost without exception by the organizations which had been approached for data, and concluded with several recommendations for facilitating the regulation of holding companies as at present constituted.

Asked specifically whether control or elimination was the purpose of the bill before the committee, Dr. Splawn replied that it was "control during the process of elimination," and reiterated it as his personal conviction that even had the investigations of the Federal Trade Commission and others not turned up a list of abuses by holding companies, their existence, even where once they may have served a good purpose, was no longer necessary or beneficial. Dr. Splawn pointed out what he regarded as the regional operations of power companies as opposed to the interstate and even transcontinental character of the operations of railroads and communication systems, and insisted that it remains his opinion that local power companies could obtain large-scale benefits without the corresponding large-scale, inter-regional connections, physical or financial. Regulation of power companies should be local, he continued, and subject to state regulatory bodies, and he urged that this was not possible where the real control of such local operating companies was vested in a holding company far removed from the state or municipality concerned.

Judge Healy testifies

At a subsequent hearing Judge Robert E. Healy, member of the Securities and Exchange Commission and formerly counsel for the Federal Trade Commission, testified that abuses not already voluntarily corrected by the holding companies themselves might be satisfactorily eliminated by federal regulatory measures. During his description of Associated Gas & Electric affairs Judge Healy was repeatedly interrupted by Charles A. Wolverton, Representative from New Jersey, and by Clarence F. Lea of California.

Judge Healy readily admitted that most of the holding companies which had been guilty of objectionable practices were of their own volition proceeding to eliminate many of them.

Pressing his objections to the Wheeler-Rayburn measure, Representative Wolverton got Mr. Healy to agree that it was entirely possible through corrective legislation to prohibit the millions of dollars by write-ups found in the financial statements of holding companies by the Federal Trade Commission. He conceded further that since the holding company bill was proposed primarily to protect investors and consumers against alleged evil practices, their interest could be protected by regulatory legislation without compelling dissolution of the organizations in which their investments were made.

Leaders make spirited attack

Utility executives continue their attack on the Rayburn bill in special letters addressed to their security holders. Alex Dow, president of the Detroit Edison Company, characterized the measure as "a most destructive and drastic piece of legislation. If passed in its present form it will seriously affect the values of all utility securities, those of operating as well as of holding companies. This legislation is a sample of the spirit of propaganda against utility companies to which the public has been subjected for some time. This propaganda makes an unwarranted, sweeping indictment of an entire industry because of the alleged wrongdoing of a small number of companies. By far the preponderant part of the utility industry is sound and constructive, and the generalized charge of mismanagement and fraud is grossly unfair."

In a joint letter to stockholders C. E. Groesbeck, chairman, and S. R. Inch, president of Electric Bond & Share Company, terming the proposed legislation "grossly unfair and unjust," maintained that if enacted into law, it "will destroy a large and useful industry and public service, holding and operating companies alike." George Tidd, president American Gas & Electric Company, said that the bill is "utterly vicious" and would greatly injure all operating utilities.

A statement was issued by the United Gas Improvement Company to the effect that there will emerge a full-fledged system of government operation, centralized, bureaucratic and costly, which can only lead, in the end, to complete socialization of the utility industry.

Protests were also made by Henry L. Doherty, Philip G. Gossler, H. Hobart Porter, Thomas N. McCarter and J. F. Fogarty.

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Riparian Rights Theory Replaced in California

Establishing the rule of "reasonable use," the state Supreme Court has laid down a new water doctrine for California, overturning the 80-year-old riparian rights theory. The Supreme Court's decision will have a vital effect upon the ultimate construction of the great central valley water project in that it will not be necessary for the government to pay for waters which riparian owners cannot use, but the right to control which the old doctrine recognized.

The new water doctrine repudiating the riparian theory was handed down by Associate Justice John W. Shenk in the case of Peabody vs. the city of Vallejo. The case involved floodwaters, riparian waters, appropriated waters and underground flow and storage waters.

Following the ruling, City Attorney O'Toole said that the decision protects San Francisco's $128,000,000 Hetch Hetchy investment and will end pending litigation against the project.

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Tax Rehearing Denied

Petition of the state of Illinois for a rehearing on the question of payment of the 2 per cent sales tax by public utility companies has been denied by the state Supreme Court. This action by the high court will result in the release to the Commonwealth Edison, Public Service Company of Northern Illinois and Peoples Gas Light & Coke companies of more than $3,600,000 in accruals against this tax which had been set up in their income accounts in 1934 and 1933.

T.V.A. Denied Right to Compete With Private Utility Companies

Judge Grubb in Alabama rules that federal agency cannot sell electric energy — Surplus power right conceded — Court also bars P.W.A. funds — T.V.A. to appeal case

Sale of electric energy by the Tennessee Valley Authority in competition with private utilities was declared illegal last week by Judge W. I. Grubb in the federal district court in Birmingham, Ala. Dealing specifically with a contract of January 5 under which the Alabama Power Company transferred its northwestern Alabama transmission lines to the T.V.A., Judge Grubb held that under the terms of the contract the T.V.A. would be put in the attitude of conducting a business in the State of Alabama in a proprietary way without the legal authority to conduct such a business.

Judge Grubb also made permanent his temporary restraining order enjoining fourteen north Alabama towns from accepting or expending P.W.A. funds for the construction of competing systems. The oral decision was made in a suit brought by a group of holders of Alabama Power preferred stock, contesting the constitutionality of the T.V.A. act and of the T.V.A. yardstick program.

Surplus power defined

Conceding that attached to a constitutional power, such as navigation, national defense or flood control, a surplus of energy could be sold, Judge Grubb stated: "It (T.V.A.) has a right to sell the surplus energy defined to be the energy over and above what the T.V.A. would create in the use of some of its granted constitutional powers. . . . Now, I get the idea from the proof—I have listened to it intently—that the endeavor of the Tennessee Valley Authority, not necessarily that the act says so, but the administrators, the directors in the administration of the affairs of the Tennessee Valley Authority, have not arranged to dispose of merely a surplus of that kind, but, on the contrary, that they have treated any surplus created by them of any size and without any regard to its being created for the physical—I mean the power being created only for the physical needs, and having done so with the expectation of disposing of it, either in the way of furnishing an example as to how cheap power could be made when the government made it or in aid of this experiment that is being conducted in the valley. . . . It seems to me that the evidence does show that this isn't a surplus, and that it is not to be attributable to any constitutional power; and therefore it leaves the Tennessee Valley Authority in its disposition of it in the attitude of a proprietary utility, just as the Alabama Power Company was before it made this contract, and therefore that it is doing so is *ultra vires* of its right as a corporation, and that its directors in doing so acted *ultra vires* of their charter."

Concerning the right of the P.W.A. to lend money for the construction of competing systems, Judge Grubb ruled: "Undoubtedly the P.W.A. and the T.V.A. think they are doing the right thing; but if the court holds it is an *ultra vires* thing, the T.V.A. engaging in this business, then it seems to me, through the knowledge of the P.W.A., it affects their right to loan money and the right of the municipalities to receive the money, to receive it to aid in carrying out illegal competition, or based on an illegal competition, or based on an illegal business, and in that event the T.V.A.'s distribution would be illegal; so, it seems to me that the injunction ought to be made permanent as to that feature of it in the final decree."

T.V.A. to appeal case

Announcement was made by James L. Fly, chief counsel for the T.V.A., that an appeal would be filed. Henry T. Hunt, chief counsel of the Public Works Administration, who will join with the T.V.A. in appealing the case, said that it was not decided whether the appeal would be to the Circuit Court of Appeals in New Orleans or directly to the Supreme Court by a writ of certiorari.

In commenting on the decision, David E. Lilienthal of the T.V.A. said: "The effect of the decision upon T.V.A. activities is to defer the transfer to T.V.A. of certain transmission lines in Northwest Alabama, purchased from the Alabama Power Company. The authority's operations, including construction activities on three dams and the sale of power to various communities, is in nowise affected by the trial judge's decision, and will proceed as usual."

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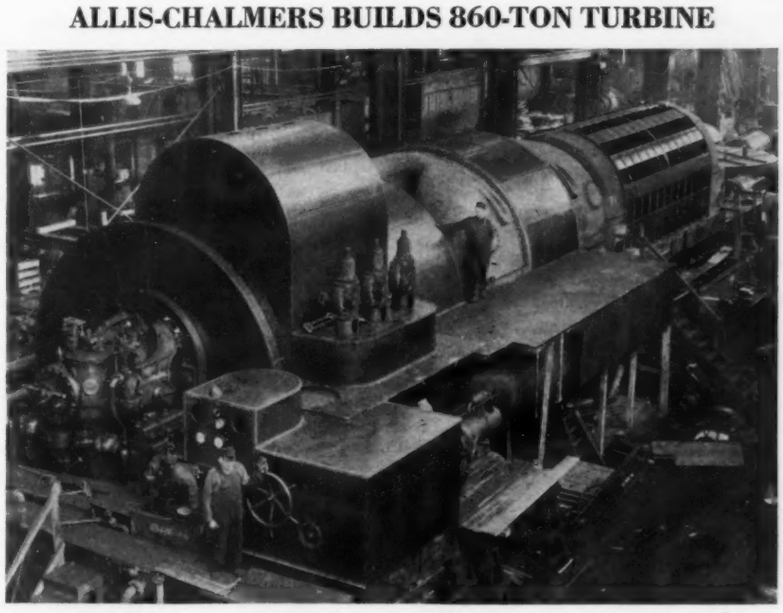
Michigan Utility Serves 23 Farms Underground

Just placed in service in a rural section of the Consumers Power Company system in Michigan is the first installation of "Coprsheath" concentric-conductor underground cable, made by the Anaconda Wire & Cable Company. It is 3¼ miles long, operates at phase-to-ground primary voltage and serves 23 farm customers. The cable was laid 18 in. deep 25 ft. inside the fence line with a cable-laying plow during December in a total time of 15½ hours, despite various adverse conditions, including mud, sleet, low temperatures and 6 in. of frozen ground. At each customer the cable is looped up the transformer pole, from which service wires extend to the customer.

ALLIS-CHALMERS BUILDS 860-TON TURBINE



Rated at 80,000 kw., with a capacity of 135,000 hp., this giant steam turbine, built by Allis-Chalmers, will soon be installed at Port Washington, Wis., by the Milwaukee Electric Railway & Light Company. The unit operates at 1,200 lb. steam, 825 deg. F. Revolving at 30 r.p.m., tips of the blades of the low-pressure spindle travel at a speed of 600 m.p.h.

State Legislatures Discuss New Utility Measures

Many state legislatures have had under consideration during the past few weeks important utility measures. In Colorado 28 such bills and in Massachusetts more than 100 have been offered. In New York, New Jersey, Alabama, Indiana, and Washington utility bills have been a prominent feature of the new legislative program.

Bills carrying out Governor Hoffman's recommendations for reorganization of the New Jersey Board of Public Utility Commissioners were passed by the Senate last week and this week by the Assembly. Two of the measures would empower the commission to negotiate for rate adjustments pending hearings and would require final disposition of rate cases within six months. The other bills in the series would regulate loaning of money and property to holding companies by utilities, give the commission authority to prohibit dividend payments unless warranted and require utilities to keep within the state all records relating to transactions and property in New Jersey.

Governor Lehman of New York recently approved the Burchill bill, authorizing the Public Service Commission to direct any public utility to award contracts for the construction, improvement or extension of its plant, works or system, exceeding in amount $25,000 in any calendar year, to the lowest responsible bidder, after public offering and advertisement of notice. This is one of the bills contained in Governor Lehman's public utility legislative program of 1934 which failed of passage.

The Alabama Legislature has passed the administration-sponsored Walker bill, stripping the Alabama Public Service Commission of any jurisdiction over operations of the Tennessee Valley Authority in Alabama. With party lines broken, the Indiana House of Representatives has passed a bill prohibiting public utilities from engaging in the appliance business. The vote was 57 to 40. With only two dissenting votes a constitutional amendment authorizing the State of Washington to produce and distribute electric power has been passed by the House.

By a vote of 107 to 105 the Massachusetts House this week passed a bill requiring public utility companies to give free lamp renewal service. This measure will nullify the ruling made by the State Public Service Commission last August, ordering the discontinuance of free lamp renewals on the Boston Edison system.

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London Merger Progresses

An important step has been reached in the negotiations for the merger of the six big London electricity supply companies. A new public company, London Associated Electricity Undertakings, Ltd., has been registered with a nominal capital of £300 ($1,500) to acquire 90 per cent of the issued share capital of the Brompton & Kensington, Charing Cross, Kensington & Knightsbridge, Chelsea, St. James' & Pall Mall and the Westminster companies. These companies have a combined share and debenture capital of more than £8,000,000 ($40,000,000). This financial fusion follows the announcement made last fall of a co-ordination project to which the six enterprises agreed.

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NBC Plots Field Strengths

Field strength measurements in radio broadcasting have now been completed for the nation-wide territories covered by the Red and Blue networks of the National Broadcasting Company. Eighteen crews with portable equipment traveled over 230,000 miles to make the 21,360 measurements which show just how much of an "airea" is reached effectively by the chain's stations.

In establishing the technical basis for confirming radio coverage the NBC used 500 microvolts per meter, five times the minimum set by the Federal Radio Commission, as the boundary zone for satisfactory reception under favorable conditions. Many sets will perform well on 10 microvolts.

The company is now engaged in analyzing 1,500,000 letters addressed to individual stations for correlation with the field strength data to constitute a composite index of circulation resting upon density of response per thousand radio families. McGraw-Hill data on the total number of radio families were used as a point of departure in the study.

COMING MEETINGS

Oklahoma Utilities Association—Annual meeting, Oklahoma City, Okla., March 12-13. E. F. McKay, manager, 1020 Petroleum Building, Oklahoma City.

National Fire Protection Association—Electrical Committee, biennial meeting, Electrical Association of New York rooms, 46th Street and Lexington Avenue, New York, March 19-22. V. H. Tousley, secretary, Electrical Committee, 612 North Michigan Avenue, Chicago, Ill.

Electrochemical Society, Inc.—Spring meeting, New Orleans, La., March 21-23. Dr. Colin G. Fink, secretary, Columbia University, New York.

American Institute of Electrical Engineers—Southwest District, Oklahoma City, Okla., April 24-26. H. H. Henline, national secretary, 33 West 39th Street, New York.

Missouri Association of Public Utilities—Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, asssistant secretary, 101 West High Street, Jefferson City, Mo.

EVENTS IN WASHINGTON

Within the next week the first report of the National Power Survey will be made public. It covers 98 per cent of the total sales of electric energy in the country.

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Having been denied an indefinite extension of the period in which its Flathead project may be completed, the Rocky Mountain Power Company has filed an application for an extension of time until May 23, 1938. Construction is to be resumed in May, 1936.

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Electric Power Company of New Jersey asks preliminary permit covering three power dams on the Delaware River to develop 237,000 hp.

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Declarations of intention have been filed as follows: Acme Electric Company, Portland, Ind.; Salamonie River, three dams and reservoirs, 60-ft. head; E. A. Maynor for non-profit co-operative, Meramec River, Mo.

PAUL WOOTON,
Washington Correspondent.

Georgia Cities Win Fight to Set Electric Rates

The Supreme Court of Georgia ruled last week that the Public Service Commission has no jurisdiction over rates prescribed by municipally owned or controlled power distribution plants. In its decision the high court upheld the ruling of Judge V. B. Moore of Fulton Superior Court in issuing an interlocutory injunction against the commission from attempting to lower the rates of the seventeen municipally operated power plants in the state. The action was brought by the city of Albany and joined in by sixteen other cities.

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Claude Drops Sea Power Plan

It appears that Georges Claude is to abandon his efforts to develop power from the difference in temperature of sea water at different levels. After the Cuban attempt of 1929 failed, he concentrated his efforts upon ice-making in the cargo vessel *Tunisie*. Recently, while lowering the tube off Rio de Janeiro, the anchoring weight was dropped and lost. A cablegram from Claude to London is reported by *The Engineer* as stating that he has been obliged to abandon the enterprise, delayed as it has been by interminable difficulties.

Court to Protect Insull Stockholders

Federal Judge Wilkerson at hearing on Middle West reorganization insists that investors be benefited — Tentative plan filed for Insull Utility Investments — Insull embezzlement trial set

At a hearing held last week on the reorganization plan for the Middle West Utilities Company Federal Judge James H. Wilkerson declared flatly that he intends to protect interests of stockholders of the company in his decision on the fairness of a plan under Section 77-B of the amended bankruptcy law. The hearing was opened with Louis F. Jacobson, counsel for petitioning creditors, submitting evidence he asserted would prove the company is worth only $15,000,000, nearly one-fifth of what it owes to secured and unsecured creditors. He declared he will prove the company insolvent by every possible "yardstick."

Robert N. Golding, counsel for the noteholders, interjected the remark that a modified plan of reorganization has been agreed to by all interested parties, including secured creditors, principally banks, representing $20,000,000; the noteholders, of which $45,000,000 is outstanding, and both preferred- and common-stock holders' committees.

Judge Wilkerson asked the percentage of creditors and stockholders represented by various consenting committees. Mr. Golding said his committee had on deposit 80 per cent of the notes of the company; Ogden West, attorney, said his committee of preferred-stock holders had on deposit 47 per cent; Orville J. Taylor, attorney, said his committee of comon-stock holders had on deposit or pledged about 30 per cent of common outstanding. "It appears," Judge Wilkerson said, "that not all of the bondholders or stockholders are represented by the consenting committees. There are thousands of stockholders who cannot afford to hire lawyers and are not represented. Many of them are writing letters to the court imploring the court to protect their interests. It is the duty of the court to do so, so the court will represent them."

Tentative plans for reorganization of Insull Utility Investments under the same law have been submitted to Judge Wilkerson by attorneys for three petitioning creditors. The plans provided that New York and Chicago banks, which hold most of the assets as collateral for loans, receive 60 per cent of stock in a new company which would have a million shares of no par value. Debenture holders would get 25 per cent and other creditors the balance of 15 per cent. Judge Wilkerson, acting on motion of attorneys for the petitioning creditors, continued the hearing of the reorganization petition to May 15 on condition that nothing be done to interfere with the trustee's administration of the estate under regular bankruptcy proceedings.

Samuel Insull, acquitted on federal charges of mail fraud following collapse of his utility system, has been ordered to go on trial March 4 in the Cook County Criminal Court on charges of embezzlement of $66,000.

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Glass Exposition Opens

An architectural glass exhibition opened this week at 748 Fifth Avenue, New York, under the auspices of the Corning-Steuben division of the Corning Glass Works. The exhibit, which marks the first architectural glass showrooms to be established in this country, will constitute a permanent headquarters where structural and decorative glass problems, as well as those involving illumination, can be worked out in collaboration with the Corning laboratories.

Unusual ways of handling illuminating problems with beautiful effect are demonstrated by such means as glass friezes and moldings lighted from behind and by stepped-forward ceiling in two steps which are covered by glass moldings and wired behind with four circuits of clear light and two circuits of colored lights. Among the numerous novel glass specimens developed for engineering and industrial uses which have lately been adapted to the architectural and decorative field are huge glass insulators developed for high-tension power lines.

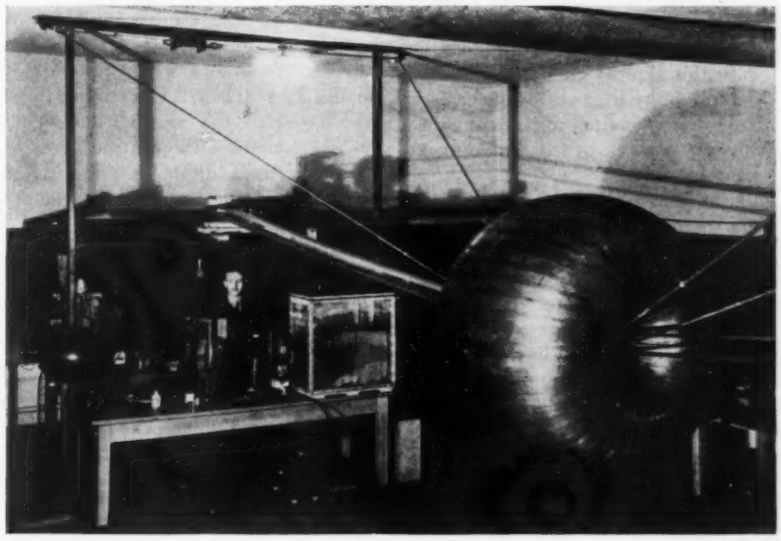
•

Engineers Seek to Raise Profession's Status

Seeking unification of their profession throughout the Dominion as the primary step toward improving the status of the engineer, the Engineering Institute of Canada held its annual meeting recently in Toronto. The institute adopted a resolution creating a committee of five "to develop the possibilities of consolidating the engineering profession."

A paper entitled the "Status of the Engineer in Industry," presented by Col. R. E. Smythe, director of the Technical Service Council, asked that the institute establish a rule of the road in co-operation with the Dominion government to curtail the number of engineers permitted into Canada to take charge of branch plants. Pointing out that some 1,300 branch plants had been established in Canada in the past fourteen years, Colonel Smythe declared: "When engineers or administrators are required they are removed from the parent plant to the branch. In isolated cases it may not affect our engineers, but with some 1,500 branch plants you will see at once the problem becomes vitally important, especially if it is considered that about 500 young engineers are graduated each year in Canada. J. M. Oxley emphasized the need of uniform and effective legislation, developed in co-operation with en-

MILLION-VOLT DOUGHNUT GENERATOR



Wide World

Development of a new type of million-volt generator has been announced by Dr. Willard H. Bennett of Ohio State University. This new electrostatic generator is of horizontal instead of vertical design, a departure from previous methods. It has a high-voltage shield in the shape of a sphere with two holes on opposite sides. The shield is charged by means of a silk belt which passes through these holes.

gineers and their colleagues, to enable the profession to deal properly with questions of qualifications and remuneration.

Frederick A. Gaby, assistant to the president of the Canadian Pacific Railway, was elected president and E. V. Caton of Winnipeg and P. L. Pratley of Montreal were named vice-presidents.

•

Chicago Engineers Discuss Hydro and Steam Costs

Unqualified statement that it is cheaper to generate power in a modern steam plant than in a hydro plant and that it costs less to transmit power in a freight car as coal than over a high-tension transmission line as electricity was made at a joint meeting of engineers gathered in Chicago recently to discuss the values of hydro as against fuel power for electricity supply. At the other extreme from this was the also unqualified assertion of a hydro champion that prime power at 2 mills per kilowatt-hour, including all costs, could be produced on the Columbia River.

Between these two opposite positions, the one occupied by W. L. Abbott, chief operating engineer of the Commonwealth Edison Company, and the other taken by L. F. Harza, well known hydro-electric engineer, lay the conclusion readily apparent from the papers of the scheduled speakers of the evening, L. E. Ayres, of Ayres, Lewis, Norris & May, on water power and Frank S. Clark, of Stone & Webster, on fuel power. This conclusion is that water and fuel power are complementary for lowest cost electricity supply in the present states of the two arts.

Another factor to be taken into account was brought forward by Frank R. Innes, ELECTRICAL WORLD, who questioned the wisdom in this rapidly changing world of the 40- and 50-year investment periods which are the principal factors making for such low cost as hydro development can claim.

Frank D. Chase, of Frank D. Chase, Inc., chairman of the meeting, forcefully decried the lack of engineering counsel in the huge public works programs of the government. He said there was need for an engineering board—even a "Secretary of Engineering" in the President's cabinet—as a final competent authority on engineering matters to see that only legitimate projects were developed and to see that the billions appropriated were wisely spent.

The meeting, jointly sponsored by the Chicago section of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Society of Municipal Engineers, the Illinois Chapter of the American Society of Civil Engineers and by the Western Society of Engineers, brought together 600 engineers.

Legislative Board Submits Report

New York utility inquiry reveals light rates are unfair, committee reports — Recommends four new measures — Lehman attacks findings — Investigation extended for another year

The New York State legislative committee investigating public utilities in a report submitted to the Legislature last week charged that the costs of residential electrical energy are grossly excessive. "These rates," the report stated, "cannot be justified when measured by the rule that rates must reflect the result of efficient management, a fair return on the property used and useful in operation, and a fair and reasonable cost to the consumer."

"We believe the present rates," the report continued, "are a result of a false conception of the trust reposed in the stockholders and their executives in their operation of a public utility. The present rates probably arise from the idea that public utilities are operated by the executives for the sole benefit of the stockholders and without consideration for the consuming public. . . . No justification exists for a continuance of their trusteeship, and the consuming and long-suffering public can only be protected by municipal operation or the rates controlled by a municipal yardstick."

Legislation recommended

In its report the committee made certain legislative recommendations. The first bill would clarify the power of the Public Service Commission with relation to the Washington plan, so that that plan could be put into effect if an agreement on a fair rate base and a fair rate of return should be reached. The second measure would permit the putting into effect of the Commonwealth & Southern plan, providing, in addition to a lowered rate, an objective rate providing for increased rate reduction by additional use. The enactment of legislation was also recommended that would permit the merger of operating utility companies with less than 100 per cent of stock control, after approval of the Public Service Commission. Another measure would amend the bill passed last year, as part of the Lehman utility program, giving the Public Service Commission the right to fix temporary rates yielding the companies a 5 per cent return, based on the original cost, less accured depreciation, of the company properties. The amendment would prescribe a reasonable rate of return on fair value of the property.

A bitter controversy followed the submitting of these recommendations, when Governor Lehman sharply attacked the legislative committee's report, opposing particularly the suggestions concerning the "5 per cent" law, which he got through the Legislature last year after a hard battle. Milo R. Maltbie, chairman of the Public Service Commission, joined the Governor in criticising the report of the committee, but Senator John J. Dunnigan, chairman of the committee, on the grounds that the law was unconstitutional, took direct issue with the Governor.

The Legislature voted to continue its investigation for another year, after the Public Service Commission in its annual report had charged the utilities with seeking to block regulation under the Lehman utility reform laws enacted last year.

•

Electric-Heat Uses Indicate Versatility

Electric heat applications are rapidly increasing in industry and commerce, according to comments made before a recent meeting of the Electrical Association of New York. Ease of application, accuracy of control, high efficiency and ability to duplicate results are outstanding benefits which have been secured. Heat applications totaling 31,000 kw. exist in Philadelphia, according to C. E. Russell, Philadelphia Electric Company, who traced the development of industrial applications in that city. A number of applications to the solution of industrial problems, including the heating of liquids or gases, annealing and heat-treating of metals, and vulcanizing, were discussed by R. M. Cherry (General Electric), W. C. Stevens (Westinghouse), J. O. Covington (N. Y. Edison).

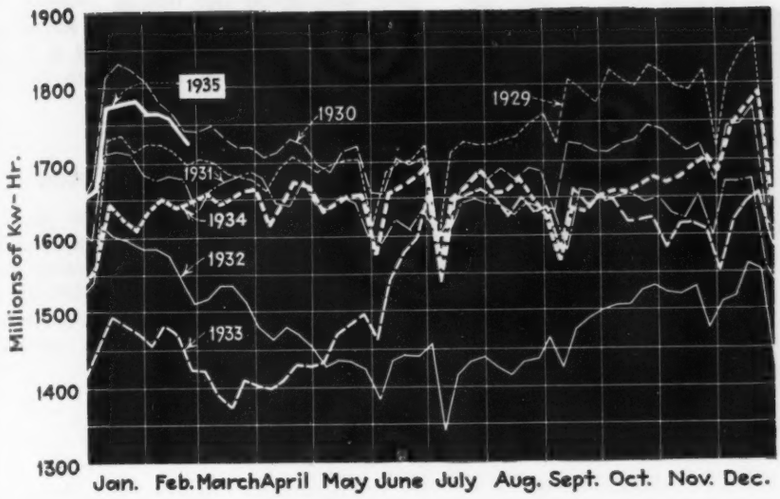
The versatility of applications is indicated by a few examples: In the Presbyterian Hospital, New York, use of electric heat prevents a variation of more than 1/10 deg. F. in biological-laboratory incubators where germ cultures are propagated. The New York Central Railroad avoids freezing and bursting of cylinder blocks in its idle Diesel-electric switching locomotives, and facilitates starting of the engines in cold weather by using 4-kw. heaters to maintain a circulating-water temperature of 160 deg. F., in the water jackets. By means of electric heat the Bishop Wire & Cable Company reclaimed damaged coils which would previously have been sold as junk, although only the insulation in the middle of the coils may have been damaged. in the power house.

•

Delta-Star Contract

Contract, involving $108,430, for metal-clad switchgear to be installed in the Boulder Dam power house has been awarded to the Delta-Star Electric Company, Chicago, by the Department of the Interior, Bureau of Reclamation, Denver. This switchgear will control 2,300-volt power supply for all auxiliary equipment.

Still Crowding the Record



Central-station energy output continues to run close to that of corresponding periods of 1930, when all-time records were established for the first six months of any year. During the past three weeks production has missed that year's figures for like weeks by less than 1 per cent; in the week of February 16 it approached within 0.7 per cent, with an output of 1,760,562,000 kw.-hr., followed by 1,728,293,000 kw.-hr. last week, according to the Edison Electric Institute.

All intervening years are being surpassed, although the excess over 1934 is becoming smaller because output a year ago was rising, contrary to all precedent, while the trend this year is more nearly normal. In the week of January 26 this excess was 10.6 per cent; last week it was 5.0 per cent. Compared with the January peak, however, the decline thus far has been less than it was in 1930.

Gains over 1934 are largest in the Rocky Mountain region. More moderate rates of increase are being maintained in the leading industrial areas.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Feb. 23...1,728	Feb. 24...1,646	Feb. 25...1,426
Feb. 16...1,761	Feb. 17...1,641	Feb. 18...1,470
Feb. 9...1,764	Feb. 10...1,652	Feb. 11...1,483
Feb. 2...1,763	Feb. 3...1,636	Feb. 4...1,455
Jan. 26...1,782	Jan. 27...1,611	Jan. 28...1,470
Jan. 19...1,778	Jan. 20...1,625	Jan. 21...1,484

Per Cent Change from Previous Year

Region	Week ended Feb. 23	Feb. 16	Feb. 9
New England	+ 3.3	+ 2.6	+ 2.8
Middle Atlantic	+ 2.7	+ 3.2	+ 4.5
Central Industrial	+ 5.8	+ 9.0	+ 8.8
West Central	+ 6.3	+ 7.4	+ 9.1
Southern States	+ 6.0	+ 7.1	+ 7.9
Rocky Mountain	+13.6	+15.6	+15.2
Pacific Coast	+ 1.6	+ 4.9	+ 4.7
United States	+ 5.0	+ 7.3	+ 6.8

N.E.M.A. Assails Thirty-Hour-Week Bill

In a letter from Frank C. Jones, president, to Senator Henry F. Ashurst, chairman of the Senate judiciary committee, the National Electrical Manufacturers' Association has filed its protest to the Black 30-hour-week bill.

"Industry cannot accept the idea," the letter declared, "that leisure through reduction of the working week can be created economically to such an extent that normal volume of goods and services can be produced at the current stage of development of industrial processes. We firmly believe that there would be a gradual and voluntary reduction in the work week of industry as economic and industrial conditions permit it. Already, what amounts to a somewhat forced reduction in the working week has taken place under NIRA. We do not believe that the forcing of reduction of the work week can be carried farther, and many and probably a great majority of members of the electrical manufacturing industry believe that any further forcing of reduction of the work week would be disastrous, and beyond economic possibilities."

Maintaining that the 30-hour week would decrease purchasing power and retard recovery, the letter continued: "The enactment of such legislation as an emergency measure cannot be justified, if all the factors are considered. Admitting, for purposes of discussion, that the arbitrary reduction of the work week to 30 hours would tend to re-employ those now idle, the question still remains, at what price such re-employment would be achieved. In the first place, it does not follow that a reduction of 25 per cent from the prevailing 40-hour week would mean a corresponding percentage increase in employment. . . . The enactment of this legislation could result only in the retardation of recovery through the injection of further elements of uncertainty. It must inevitably prove detrimental to those very persons whom it is proposed to benefit. In the final analysis, its path lies away from and not toward the 'more abundant life.' A wise statesmanship will reject such a measure as contrary to the public interest."

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Phelps Dodge Sells National Electric Products

Phelps Dodge Corporation has sold one of its fabricating subsidiaries, National Electric Products Corporation, to W. C. Robinson and associates of Pittsburgh. National Electric Products Corporation is a successor to National Metal Molding Company with plant at Ambridge, Pa. Its business consists largely of steel conduit and other allied steel products. The company also does some wire business. Phelps Dodge Corporation retains as its fabricating subsidiary Phelps Dodge Copper Products Corporation.

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Electric Controller Earns $2.52 a Share in 1934

For the year 1934 net profit of the Electric Controller & Manufacturing Company after taxes, depreciation and other charges totaled $178,786, including a special credit restored to income from reserves, set aside in 1928 and 1929 to reduce Federal Land Bank bonds to market values. Last year's net is equal to $2.52 a share on 70,855 no-par capital shares outstanding and contrasts with a net loss of $79,150 in 1933.

•

Diesel Plant Contract

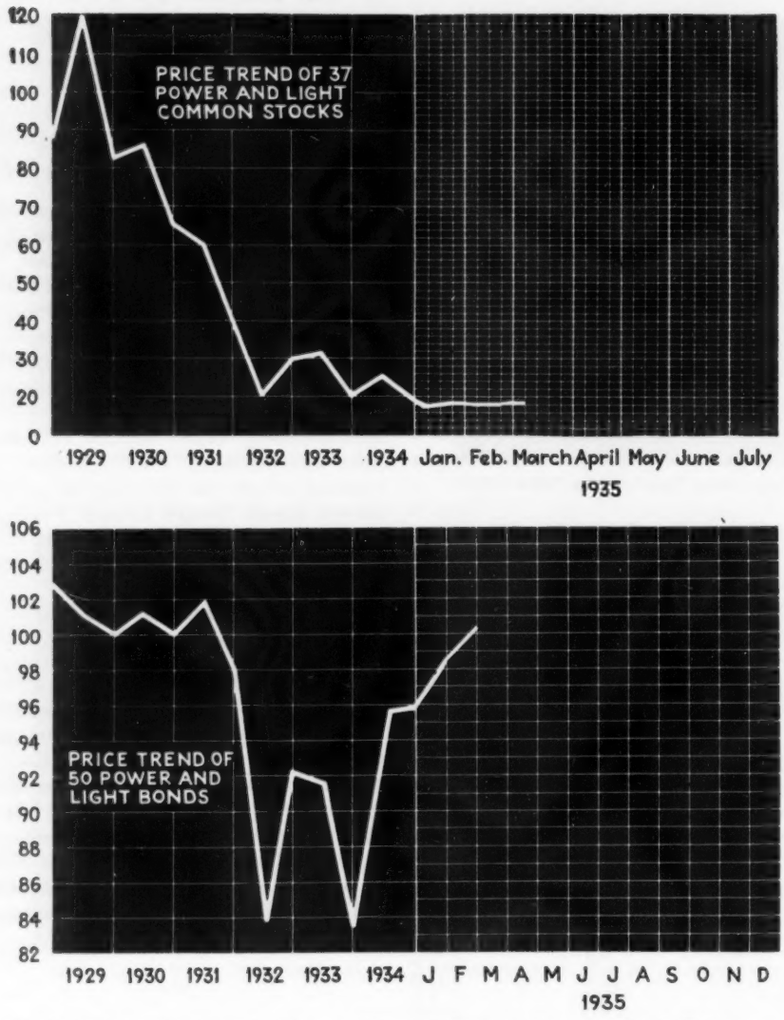
Announcement has been made by the Austin Company that it has been awarded by the Electro-Motive Corporation, a subsidiary of General Motors Corporation, a contract for the design and complete construction of its new Diesel locomotive plant. This large development for the Chicago industrial area is for the manufacturing and assembling of locomotives powered with Winton Diesel engines, similar to those used in the new streamlined trains for the Union Pacific, Burlington and Boston & Maine. The new manufacturing layout will be the most modern in design and equipment.

New York Metal Prices

	Feb. 13, 1935 Cents per Pound	Feb. 27, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.50	3.55
Antimony	14.25	14.25
Nickel ingot	35.00	35.00
Zinc, spot	4.05	4.05
Tin Straits	50.75	47.75
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Utility Bonds Advance; Stocks Weak



High-grade utility bond prices advanced during the month of February. "Electrical World" index, 100.4; January, 98.8. Uncertainty over the outlook for the utility stocks, because of the holding-company legislation now being discussed in Washington, caused weakness. "Electrical World" index, 18.0; last week, 18.5.

Consolidated Gas Net Totals $35,709,578

In the annual report for 1934, issued this week, the Consolidated Gas Company of New York reported a net income of $35,709,578, which is the equivalent of $2.18 a share on 11,476,527 shares of common stock, comparing with $48,896,442, or $3.31 a share, in 1933.

In concluding the report, George B. Cortelyou, president, said: "American business has a record of survival of crises, and improvement thereafter. Consolidated Gas Company and its predecessors have survived many difficult and serious situations in more than a century of existence. More and more this metropolitan community will require gas and electric and steam service for its industrial, commercial and domestic needs. These companies have the equipment, the experience, the skilled personnel and the forward-looking spirit to supply those services at reasonable rates as conditions demand. They have never lacked the ability to change and develop to meet changing conditions. Every effort will be made so that this record can be continued through the present difficulties."

•

American & Foreign Loans Extended Again

Bank loans of American & Foreign Power Company, Inc., held by a group of banks and the Electric Bond & Share Company and due October, 1935, have been extended to October, 1938. These loans, which originally were for a total of $50,000,000, have been reduced from time to time and a further reduction of $1,233,520 was made at the time of the extension. The loans now total $39,883,800, of which $7,976,762 is held by Electric Bond & Share. Curtis E. Calder, president of American & Foreign Power, stated also that in addition the $35,000,000 note of American & Foreign Power held by Electric Bond & Share has likewise been extended to November, 1938.

•

$150,000,000 Issue Voted

Directors of Montreal Light, Heat & Power Consolidated were authorized by stockholders at a special meeting held last week to issue up to $150,000,000 of new bonds or other mortgage securities so that, when it is expedient, outstanding bonds may be retired.

•

Blaw-Knox Net Profit

Preliminary figures of Blaw-Knox Company and subsidiaries for 1934, subject to final audit, indicate a net profit of $35,504, after taxes and depreciation, Albert C. Lehman, president, stated last week. He added that the outlook for 1935 was favorable and that the indicated profits for January, after depreciation and before federal taxes, were greater than the 1934 earnings.

•

Winnipeg Plan Approved

The joint subcommittee representing security holders of the Winnipeg Electric, Manitoba Power and Northwestern Power companies has approved the last draft of the plan of consolidation and readjustment of the Winnipeg Electric utilities group. The subcommittee is composed of nine members, incluling three from each committee representing the bondholders of the various groups. A meeting of the full committees of security holders' representatives will be held early this month, when the plan will be given further consideration.

•

Bakelite Entertained by General Electric

More than 200 employees of the Bakelite Corporation were the guests on February 18 of the General Electric Company's "House of Magic," now located in New York City. "Bakelite Night" was especially staged to give the Bakelite representatives a graphic demonstration of some of the work being carried on constantly by the General Electric Research Laboratories at Schenectady, N. Y. Many novel, and at the same time practical, advances in art, industry and the sciences were presented in fascinating educational demonstrations. The "House of Magic" will be a feature of the Industrial Arts Exposition to be held at Rockefeller Center from April 15 to May 15.

It's time to ask yourself:

ARE THE OPERATING SPEEDS OF OUR OIL CIRCUIT BREAKERS ADEQUATE? AND HOW ABOUT THE EXPENSE TO MAINTAIN THEM?

To be safe and sure

Modernize by adding oil-blast ...and do it NOW

You will avoid subjecting your old G-E breakers to short circuits beyond their ratings caused by operating conditions which have become more severe since these breakers were installed. You will benefit from the better operating characteristics that oil-blast provides.

Oil-blast improves breaker performance. Arcing time becomes more consistent and very much shorter. There is less burning of contacts and less carbonizing of oil—which reduces maintenance materially.

You can install oil-blast for only a fraction of the cost of new breakers. The change-over can be made easily and quickly. To install oil-blast usually takes only a little more time than is required for inspecting contacts and oil. Progressive companies have found that such modernization of their old breakers pays. Let us point out just what advantages you will get by modernizing *your* breakers. General Electric, Schenectady, N. Y.

810-56

GENERAL ELECTRIC

Industry Adopting Air Conditioning

More extensive industrial and commercial use noted — Increased employee efficiency among advantages cited — Substantial economies also effected.

Air conditioning is gaining increased acceptance industrially and commercially throughout the country. Several instances of it, in Pennsylvania, New Jersey and New York, were cited at a recent meeting of the Interstate Power Club (Max Cole, Philadelphia Electric Company, chairman), held in New York recently. Among the industries and businesses reported to have recently adopted it or to be planning to do so shortly are cigar factories, silk and rayon mills, restaurants, chain (including 5 and 10), drug and candy stores, women's apparel shops and funeral parlors. Progressive manufacturing policies and business competition were said to be largely responsible for the increasing acceptance of air conditioning.

Evidence was presented to show that tobacco industries had adopted air conditioning to their advantage.

Competition a factor

Use of synthetic silk has made air conditioning even more necessary than formerly in silk mills, to obtain maximum strength, avoid processing difficulties, permit high machine speeds and avoid limitation of production to territories where the weather conditions are proper. In commercial applications air conditioning is being stimulated by competition.

The economics of air conditioning office buildings had been analyzed in Philadelphia by comparing results in the Philadelphia Electric Company's own conditioned offices with those in unconditioned offices. During a period of three years there was a 45.4 per cent reduction in lost time per employee. Applied to the general commercial office average of 5.25 days lost per employee per year due to minor illnesses and evaluated at $5 per day, there could be a potential saving in all offices of $11.90 per employee by air conditioning.

•

Winnipeg Appliance Dealers Fight Hydro Competition

Private mercantile interests of Winnipeg are making a concerted effort to force the City of Winnipeg Hydro Electric from continuing to retail electrical appliances. The courts have been asked for an injunction to prevent the publicly-owned hydro system taking a $10,000 annual lease on a building prominently located in the retail center whence they may be able to conduct more profitably a retail store for electrical appliances. The court action is promoted by the Winnipeg Retail Merchants' Association. The Hydro official reply maintains that the private utility company with which it competes also sells appliances and that both of them have found it necessary to stimulate the sale of appliances in order to build up a profitable load for energy.

•

Underwriters' Engineer Reports on Bare Neutral

With the question of sanctioning of bare-neutral wiring up for active consideration by the N.F.P.A. Electrical Committee, the Underwriters' Laboratories staff has made a study of the experience with project installations and the bare neutral wiring practice generally. The report of B. H. Glover as rendered to Edison Electric Institute is on the whole distinctly favorable to this A. E. I. C. form of wiring. Excerpts from the general summary of the Glover report indicate this as follows:

In the execution of A.E.I.C. cable projects the thorough co-operation generally established between the wiring contractors and the utility sponsors, resulted in having houses wired in a complete manner, with adequate outlets and with a supervision of details assuring satisfactory service. According to the degree that such engineering attention was exercised, the quality and adequacy of installations were found to vary. The A.E.I.C. cable installations that are in service generally present a relatively high grade of construction.

A substantial percentage of existing wiring in service in buildings has numerous grounds on the grounded conductor, thus presenting conditions inherently the same as with bare-neutral wiring. A fundamental characteristic of bare-neutral wiring is the impossibility of operation with a reversal of polarity of the conductors.

Bare-neutral wiring is no longer an experiment, but on the contrary is an established practice as evidenced by its widespread use and diversified application in the face of opposition and lack of recognition by inspection authorities.

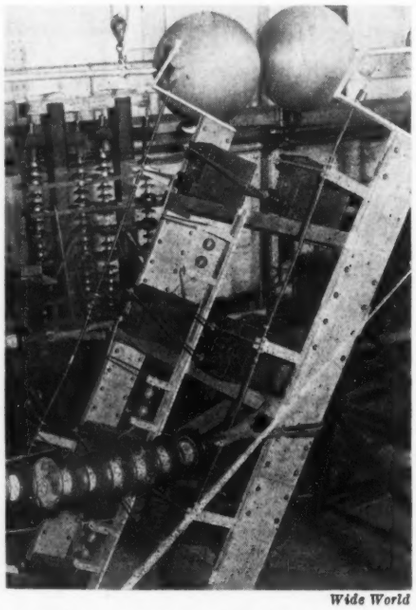
The existence of by-path currents was not found to have any effect respecting service, corrosion, arcing or heating or to have any effect respecting the fire and accident hazards of the wiring installations.

Inspection representatives interviewed expressed a willingness to permit bare-neutral wiring when and as established as a standard. In brief, their attitude and interest is academic.

Statements and rumors respecting corrosion with bare-neutral wiring have been investigated at first hand without finding any such alleged corrosion.

No complaint or criticism of bare-neutral wiring as a method has been presented by those most familiar or experienced with its application and use.

NEW "THUNDER AND LIGHTNING" MACHINE



Wide World

California Institute of Technology scientists are laying in a supply of cotton earstoppers in preparation for the not-distant day when their new thunder-making machine will be tried out in the 1,000,000-volt laboratory. The latest generator, pictured above, resembling a giant ladder, is almost completed.

•

Edison Memorial Planned

The New Jersey State Planning Board has asked the Edison Commission of New Jersey and the Edison Parkway Commission of Perth Amboy to submit detailed plans for four large-scale projects designed to perpetuate the memory of the late Thomas A. Edison. Estimated to cost $5,050,000, the proposed projects include a 13-mile Edison Memorial Parkway from Plainfield to an Edison Memorial Bridge across the Raritan River at Perth Amboy; the purchase and improvement of about 300 acres of land at Menlo Park, where the inventor perfected the electric light, and the erection of a Museum of Light on the park property. A careful study of the projects has been promised by the state board.

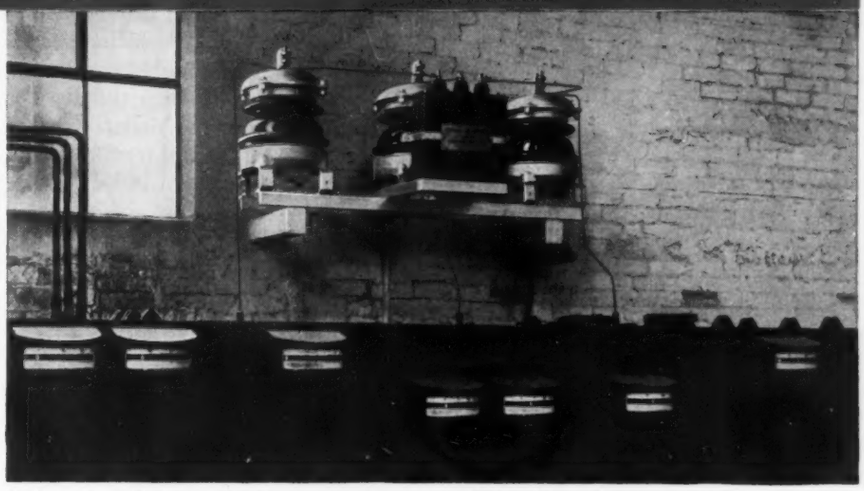
•

District Bond Issue Fought

Two separate demurrers have been filed in the Superior Court of Sacramento to the $12,000,000 bond issue voted by the Sacramento Municipal Utility District, proceeds of which are to finance an electric generation and distribution system. The Pacific Gas & Electric Company and Dr. Frank P. Brendel, as a resident of the district, have attacked the validity of the issue on the grounds that the directors have not given specifically the location of and type of electric generating and distribution system to be used. They also object to the fact that it has not been made clear whether the bond issue will build an entire project or merely a unit.

COMPLETE LIGHTNING PROTECTION ....from the Generator to the Meter

Modern Lightning Protective Equipment for Every Part of the Modern Electric System



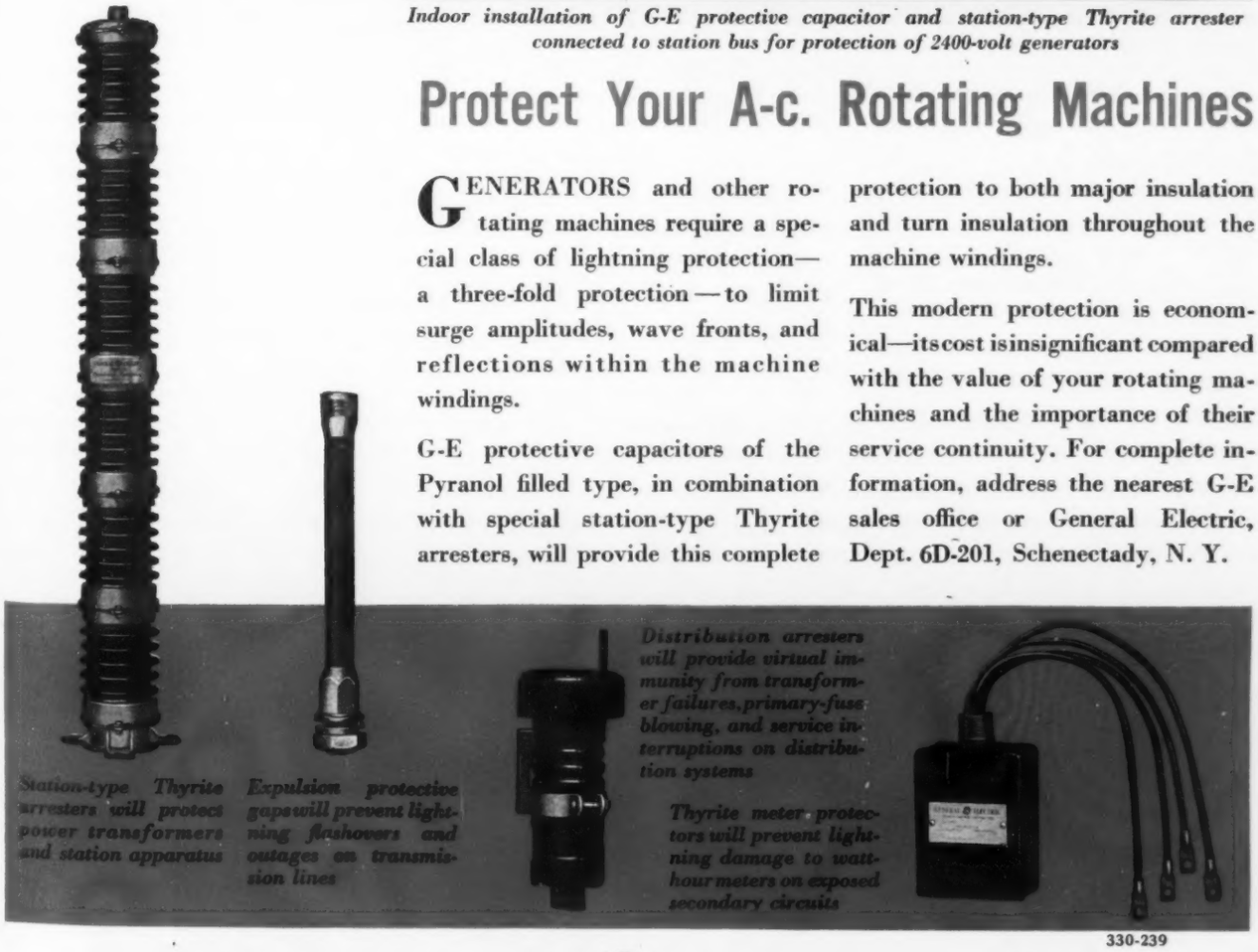
Indoor installation of G-E protective capacitor and station-type Thyrite arrester connected to station bus for protection of 2400-volt generators

Protect Your A-c. Rotating Machines

GENERATORS and other rotating machines require a special class of lightning protection—a three-fold protection—to limit surge amplitudes, wave fronts, and reflections within the machine windings.

G-E protective capacitors of the Pyranol filled type, in combination with special station-type Thyrite arresters, will provide this complete protection to both major insulation and turn insulation throughout the machine windings.

This modern protection is economical—its cost is insignificant compared with the value of your rotating machines and the importance of their service continuity. For complete information, address the nearest G-E sales office or General Electric, Dept. 6D-201, Schenectady, N. Y.



Station-type Thyrite arresters will protect power transformers and station apparatus

Expulsion protective gaps will prevent lightning flashovers and outages on transmission lines

Distribution arresters will provide virtual immunity from transformer failures, primary-fuse blowing, and service interruptions on distribution systems

Thyrite meter protectors will prevent lightning damage to watthour meters on exposed secondary circuits

330-239

GENERAL ELECTRIC

Painting Protects and Instills Pride

Protection against the deteriorating influences of moisture, weather and corrosive gases is the primary incentive for surface protection of powerhouse or substation structures and equipment. But appearance is also a consideration. Making the equipment and surroundings attractive, or at least unobtrusive, instills pride in employees, increasing cleanliness and even efficiency. Public objection to outdoor structures is frequently reduced by attractive surfacing. The initial outlay for proper surfacing is usually less than the maintenance expense for poorly protected surfaces.

These two purposes of surfacing have frequently resulted in disagreement regarding the paint to use. Often dark paint is favored because of durability, although light paints are more attractive.

Equipment outside and inside the Riverbend station of the Duke Power Company has been both protected and made more attractive by the use of aluminum paint, according to reports and as the illustrations demonstrate. The durability of the paint is reported to be due to the film of metallic flakes which lie flat when mixed with a good grade of suitable varnish vehicle, making a surface which is highly resistant to the entrance of moisture and light rays that disintegrate the binder. Used on oil circuit breakers and transformer tanks, the paint reveals oil leaks, readily simplifying inspection and reducing hazards of damage through loss of oil. On transmission towers and structural steel the paint, by contrast, quickly reveals any tendency to rust, so the process can be halted. Inside the boiler house all equipment above the dado line is coated with aluminum paint. The smokestacks and water tank are likewise surfaced.

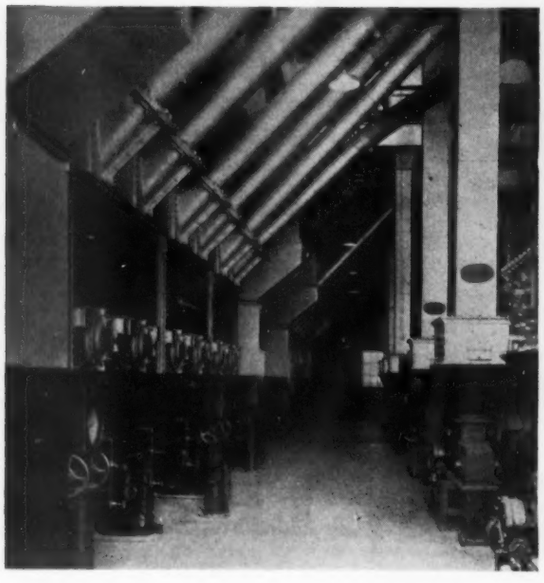
•

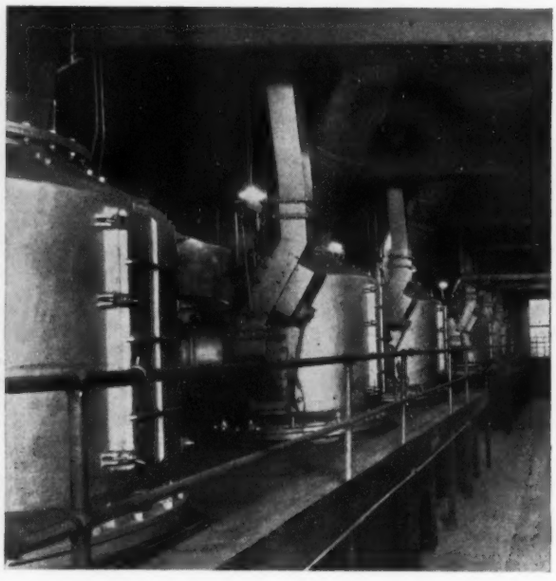
Low-Cost Distribution

Supplying the conveniences of electricity without marring scenic beauty with power structures is a problem that has been solved in many ingenious ways by engineers of the National Park Service. Funds being limited and underground distribution necessary for esthetic reasons, they have evolved an underground practice that gives a high degree of reliability for the limited loads encountered.

Compound seals joints in park underground circuits

In the accompanying illustration will be seen the manner in which branches, cut-ins or ties are made in the three-conductor, parkway type cable that comprises a major percentage of the underground services. Cables are spliced inside the cast-iron junction box which lies at the bottom of a 2-ft. trench. Hot impregnating compound then is poured in through an opening in the cover and, upon solidifying, seals the joint in an effective manner. The distribution system





Boiler house equipment above dado line protected with aluminum paint

Note clean protective surface on pulverizing mills, coal piping, furnace fronts and structural steel. Raw coal bunkers, coal scales, smokestacks and water tanks similarly protected.

● LOOK INTO G-E CUTOUTS

Check these features of the G-E ENCLOSED INDICATING *and* DROP-OUT Fuse Cutout

THE G-E 2-in-1 porcelain-enclosed fuse cutout provides for operation in either of two ways, depending upon which you prefer:

INDICATING—When the fuse link blows, the door pushes out at the bottom, giving clear indication to an observer on the ground, without exposing the live contacts and mechanism.

DROP-OUT—For locations where you would rather have the drop-out action, all you have to do is remove a small wire yoke (no tools required), and the door drops open when the fuse link blows.

CONSTRUCTION

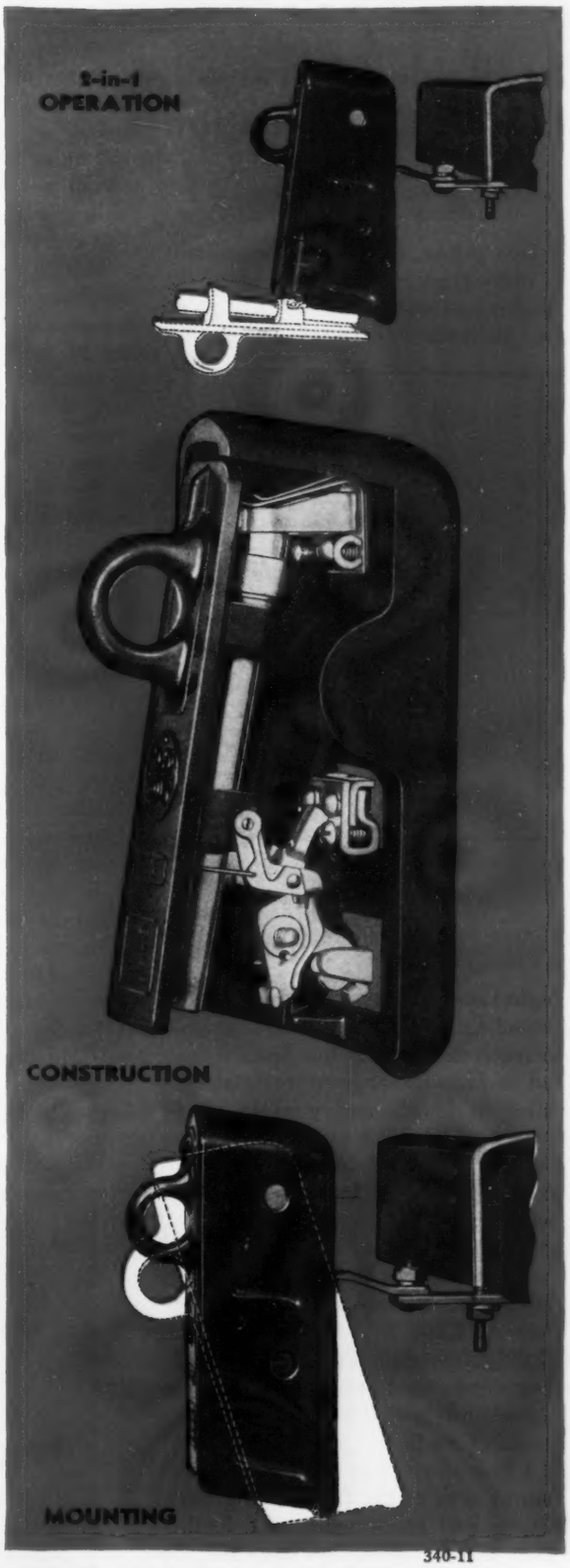
To provide positive operation, careful attention is given to every detail of material and workmanship. Typical of the construction features are the fuse-holder tube of fiber over which is wound linen Textolite, an exceptionally strong weatherproof material; a phosphor-bronze spring in the toggle mechanism, which pulls the fuse link from the fuse holder at all fault currents at rated voltage; and a barrier which prevents hot conducting gases from bridging the contacts and causing flashover.

MOUNTING

To meet your particular installation requirements, the hanger provides for mounting the cutout either in a vertical position or at an angle. In either position, the cutout may be swiveled to any desired horizontal angle.

The 2-in-1 cutout supplements the popular and accepted line of G-E porcelain-enclosed cutouts illustrated above

The cutout is furnished in ratings of 60 amperes, 5000 volts and 60 amperes, 7500/12,500 Gr. Y volts. Ask your G-E representative for further information, or send for Bulletin GEA-1993, which gives complete descriptive and operating data. General Electric, Dept. 6C-201, Schenectady, N. Y.



340-11

GENERAL ELECTRIC

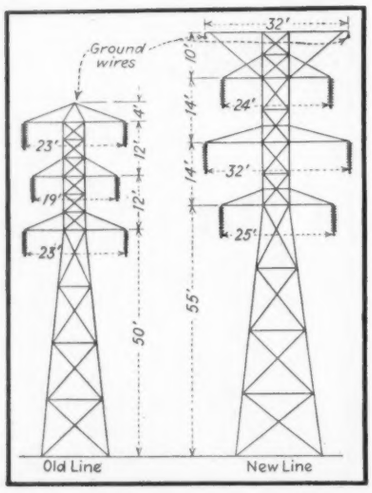
is buried directly in the ground, being protected only by a warning board placed over the cable before the trench is backfilled.

•

Available Clearance Used in Co-ordination

By E. W. HATZ
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.*

Two 132-kv. circuits are being built to carry electricity from the new Port Washington station into the system of the Milwaukee Electric Railway &



New 132-kv. towers are higher and wider

The difference between these towers represents a decade of experience in transmission and insulation co-ordination.

Light Company. One of the new lines, extending west from Port Washington to reach the existing line from Appleton to Milwaukee, is approximately 5 miles in length and consists of 44 towers, which have greater clearances between arms and from conductor to steel than was formerly believed necessary.

The suspension insulating string consists of twelve $5\frac{3}{4}$-in. units, 75 in. in length and having an impulse flashover of 1,500 kv., for co-ordination slightly less than the 6-ft. separator from conductor to steel which requires approximately 1,600 kv. at 2 microseconds time lag.

A ground rod was driven at the bottom of each of the four footing excavations and connected to the footing steel. Of the towers now installed, the resistance of the footings averages less than 2 ohms and in only one case did it exceed 5 ohms.

*Extracted from paper to Wisconsin Utilities Association.

A study of operating records of all of the 132-kv. lines of the company shows that the number of interruptions due to lightning averages approximately five per 100 miles per year. According to data which have been prepared as the result of transmission line calculations and observations on operating lines 0.5 interruption per 100 miles per year is to be expected on the new towers. For a line 5 miles in length it would mean one interruption every 40 years.

The existing line which is to be reconstructed was originally built with a suspension insulator string consisting of ten $4\frac{3}{4}$-in. spaced units. Due to lowering the hanger bars, the clearance from conductor to steel is increased sufficiently to permit the use of an additional insulator, making eleven $4\frac{3}{4}$-in. units or nine of the $5\frac{3}{4}$-in. units. Such an insulator string is approximately 63 in. in length and has a flashover of 1,100 kv.

•

Meter Test Costs Reduced 13 per Cent

Fifteen per cent more meters can be tested per man by departing from an obsolete routine practice, reports one operating company. Instead of having meter testers report to headquarters each morning for assignments and again in the evening for filing reports, they are given a week's assignments and report only once a week. The increased effectiveness of this procedure comes from the elimination of trips to and from headquarters, as testers can go directly from their homes to work, and vice versa.

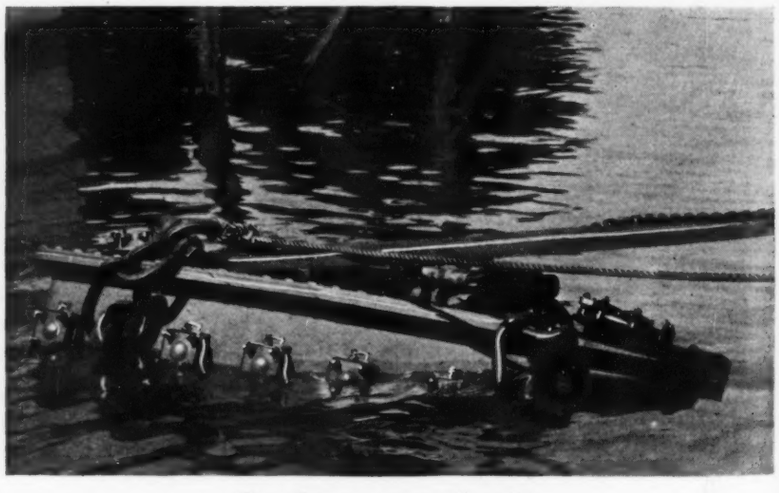
With this simple change about thirteen regular five-year tests of domestic watt-hour meters are averaged per day. This speed is dependent on routing the calls so they are adjacent and in consecutive order. Testing out of order and "call-backs" because of inaccessibility of meters will reduce this rate of testing.

•

Accident Proves Unit's Submersibility

En route to the Tide Water Power Company for installation at Wilmington, N. C., this 5,625-kva., 105/34.5/12-kv., 60-cycle, three-phase Inertaire Westinghouse transformer fell into the river while being transferred from a barge to shore. The crane boom buckled and the transformer, which was about 6 ft. above the water, dropped and settled in the mud at the bottom of the river. During high tide it was submerged about 3 ft. in salty water and remained there for ten days.

After removal from the river, examination showed that the transformer had not been injured in the least, according to Westinghouse engineers. The transformer had been shipped from the factory, without oil in the tank, but filled with a dry inert gas under several pounds pressure. After the transformer was recovered from the river a satisfactory pressure of gas still remained in the tank and it was found that no moisture had entered. The mud and sludge were washed off and the transformer was placed in operation beside its mate, which had not had such unusual bath and rough treatment.



Transformer turns submarine

THE *New* CLIP-ON AMMETER

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Gentlemen:

Kindly send me a copy of your booklet describing your NEW CLIP-ON AMMETER.

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Air Conditioning Extends

By I. S. ADELBERG
Century Electric Company, Cleveland

What the developing art of air conditioning will mean to the electrical manufacturer, contractor and user is indicated by the installation put into operation last summer in the F. & R. Lazarus & Company department store in Columbus, Ohio. Here in this one job are represented the sale, installation and wiring of a 200-kva. bank of transformers, of two large synchronous motors and of 79 small motors scattered over six floors and basements.

With air conditioning on all six floors, including four restaurants, numerous fitting rooms, entrance lobbies—in fact, all departments and spaces accessible to customers, totaling 480,000 sq.ft. of selling space—the Lazarus establishment is claimed to be the first large store in which a complete job has been done. The installation is capable of handling 18,000,000 cu.ft. of air per hour; that is, the air may be changed completely every fifteen minutes; 1,500 tons of refrigeration is available, of which 900 tons is represented in the ground water used in the system and 600 tons in three 200-ton compressor units.

Water for the system is raised from a 325-ft. well, 1,000 to 1,750 gal. of it per minute, by a Deming turbine pump driven by a 125-hp. vertical motor. Because the water contains more than a trace of sulphur odor it is returned promptly to the ground after it has served its purpose in the cooling system. The water rises at 54 deg. F. and its temperature is lowered to 42 deg. by the York refrigeration units using Freon. One is driven by a 150-hp. motor and the other two by one 225-hp. motor. Both motors are synchronous type, Allis-Chalmers make.

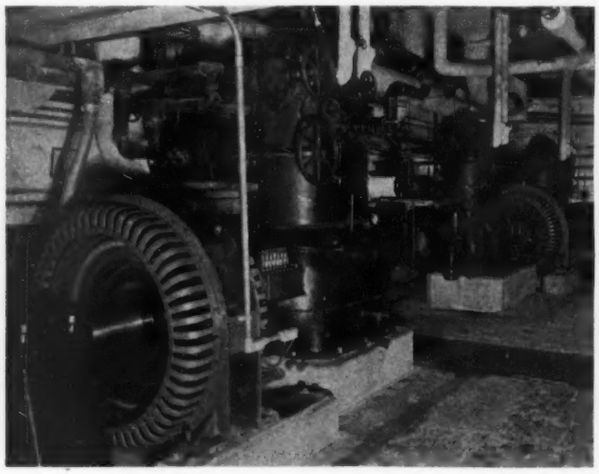
After being refrigerated the ground water is pumped through the store building in ceiling-suspended pipes to 56 unit air coolers on the first and upper floors and to 23 larger units located in the basement and at street level. From these units the water returns at a temperature of from 64 to 66 deg. F. to the Freon condenser and to the discharge well earlier mentioned. Each cooling unit is equipped with filters, cooling and dehumidifying coils and has an outside air connection through which 30 per cent of fresh air is taken. The blowers in the 56-unit coolers are operated by 2-hp. Century motors automatically controlled with Powers Regulator Company pneumatic equipment to maintain 50 per cent relative humidity at the temperature which is automatically set in relation to that of the outside air. The 23 larger units also use 2-hp. Century motors to make a total of 79 of these motors used in this one installation.

A relative humidity of 50 per cent, according to Edward A. Ashley, consulting engineer, who directed the installation of the plant, is responsible for the absence of the feeling of extreme coldness when entering or dampness when leaving the store. The usual tendency in air conditioning is to drop temperature rather than control humidity, with the result that people feel the decided difference between outdoor and indoor temperatures causing momentary discomfort.

•

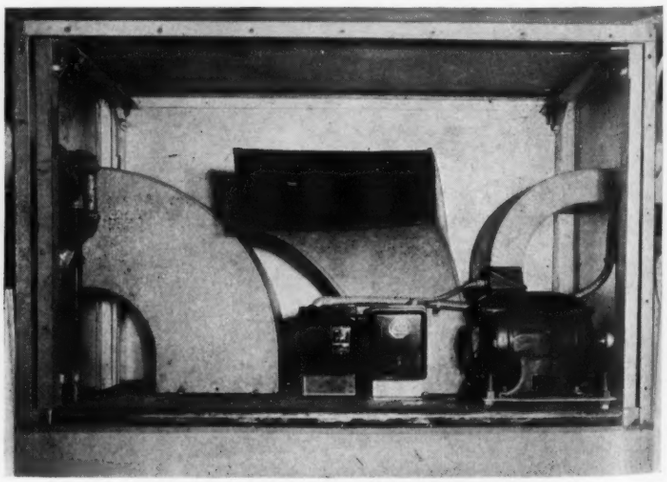
Electrolytic Process Improves Finish

Aluminum coatings which do not conceal the natural luster of metal can be applied in a thick, durable and stainproof film by electrolytic methods, reports M. R. McConnell, West



Usual operation is on one motor

Two of the three 200-ton Freon compressors are driven by one 225-hp. motor and the third is separate on a 150-hp. motor. This arrangement combines flexibility of unit size with economy.



One of the 79 air-tempering units

In the bottom half of the cabinet are the cooling coils, which are connected to the water pipes at the left, and also the blower, which is belt driven by the motor at the right.

L-M FIBRE CONDUIT

is

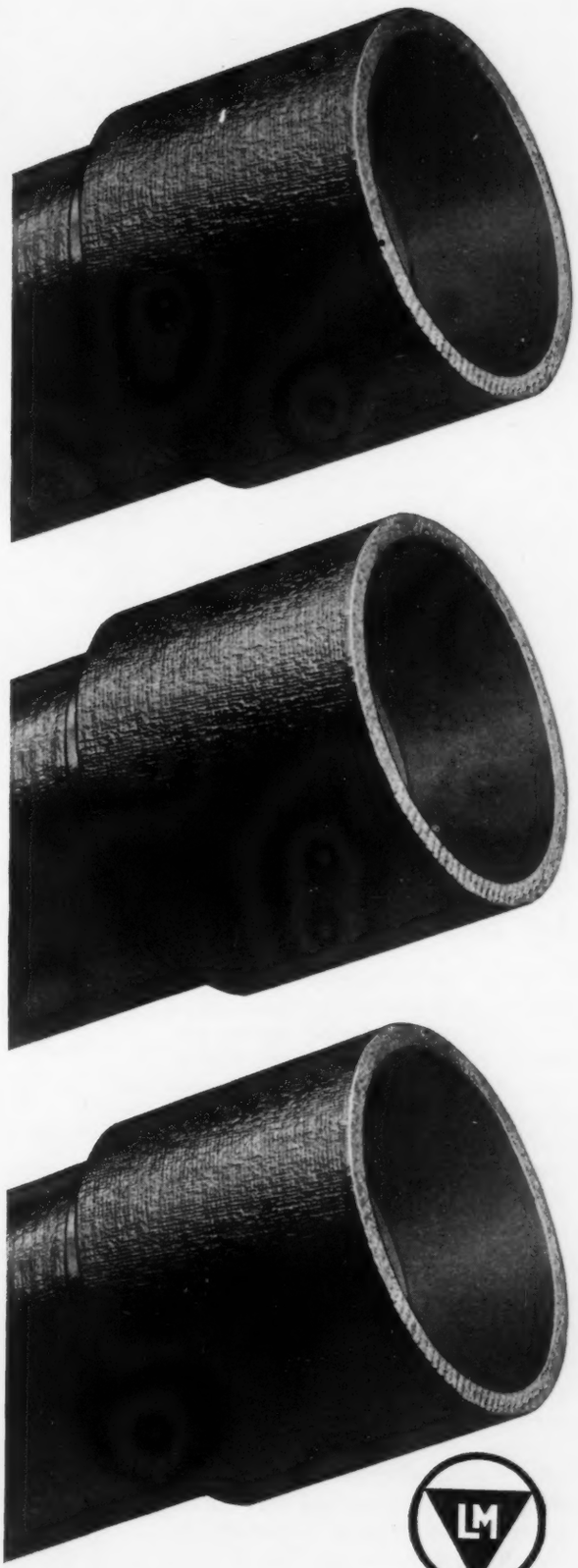
Strong!

Permanent!

Uniform in size!

Smooth inside!

Tight in joints!



LM

LINE MATERIAL CO

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Penn Power Company. An anodic oxidation process is employed. The oxide coating is produced by making the article to be treated the positive terminal in a sulphuric acid bath. Direct current of about 15 amp. per square foot, at 15 to 25 volts, is passed through the material for 20 to 40 minutes, depending upon the surface.

Nearly any color may be obtained by immersing the article in a solution of organic or inorganic materials. A sealing process prevents the coating from being stained by soot, dirt, grime, oil or fingerprints. The finish can be wiped clean with a damp cloth. Coatings may be produced with high corrosive and abrasive resistance; they can be made impervious or absorptive. Excellent dielectric characteristics may also be obtained, it is reported. This coating has been applied to architectural aluminum, statuary, washing machine agitators, fishing reels, automatic pencils and a large number of novelties. Automotive pistons treated in this manner have a greater surface hardness and are able to resist abrasion better than those not coated, it is declared.

•

Softening Leather by Refrigeration

Power for refrigeration will be needed in the leather industry if a new process for softening leather, patented in Germany, comes into general use. In this process the drying and subsequent stretching of tanned hides becomes superfluous and the finished leather is claimed to be much softer than that produced by any other process.

According to a report in "The Electrical Products Trade Notes" of the Department of Commerce the damp or only slightly dried hides are subjected to a temperature of about 6 deg. C. below the freezing point and are thoroughly frozen. Exposure to currents of cold and dry air has proved most effective. The water in the cells crystallizes and through its expansion in freezing separates the hide fibers and loosens them without breaking their interconnection. This produces the softest possible upholstery or upper leather, it is claimed.

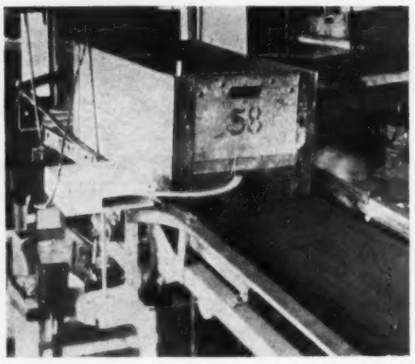
The degree of softness and flexibility of the leather depends on the water content of the hides when they are placed in the refrigerator and on the method of freezing. The desired degree of softness can therefore be regulated.

The cost of the refrigerator is offset by the fact that stretching machines are no longer required. By the elimination of drying and stretching production is considerably speeded up.

•

Conveyor Ramp Belts Run When Needed

By W. M. STREBY
The Hoover Company,
North Canton, Ohio



All the motor-driven booster belts on the conveyor system are arranged so that they start automatically when boxes approach the booster station and stop as soon as they have cleared the belt. This is accomplished by means of a time switch which consists of an arm extending over the belt in the path of the boxes advancing along the rollers. The first box strikes this arm, swings it back and closes a contact which starts the motor drive for the booster belt.

The arm swings against spring tension on a vertical shaft over a ratchet wheel, which is rotated through worm gears by a wheel riding on the under side of the belt. As the conveyor belt runs, the ratchet wheel allows the arm to return gradually to its original position, when the switch control opens, stopping the belt.

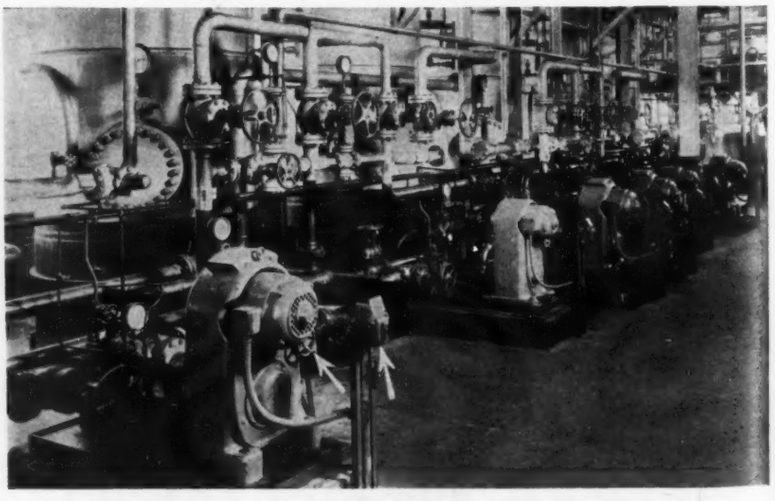
With this arrangement a train of boxes can be run over the belt without spacing, since the last box determines the time of belt operation after it passes the arm, the other boxes having held the arm back and the ratchet allowing it to slip on the vertical shaft.

•

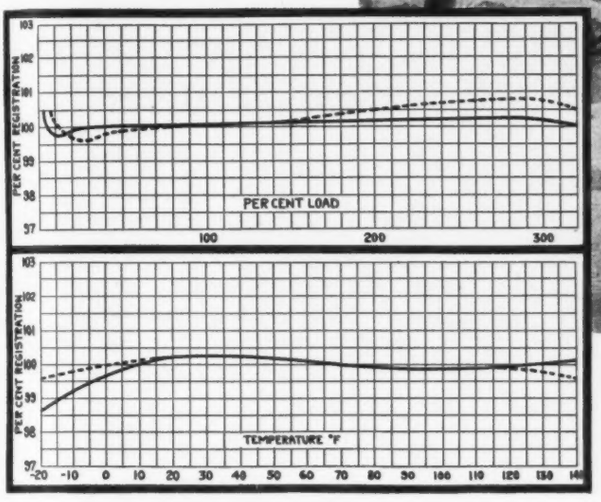
Adjustable-Speed Squirrel-Cage Drive

Combining the simplicity and reliability of the squirrel-cage motor with the speed variation of wound-rotor induction motors but without the complicated control of the latter, these pump drives are indicative of the trend toward simple, reliable and low-cost electrical equipment for industrial applications. They consist of a squirrel-cage induction motor integrally combined with a mechanical speed changer which provides practically infinite variation of the output-shaft speed between wide limits by adjusting small handwheels to the right and below the motor (see arrow).

Note the start and stop controls in front of each speed-control handwheel. The installation is in the Union Oil Company's refinery at Oleum, Calif. The motor-drive units were made by the Sterling Electric Motor Company, Los Angeles.



Start, stop and wide-speed-range control for each pump drive



Load and Temperature Curves
Sangamo HF Meters
Solid Lines, Unity Power Factor
Dotted Lines, 50% Power Factor

CHARACTERISTICS *that protect your revenue*

MODERN LOADS demand the use of watthour meters with excellent overload curves. Outdoor metering emphasizes the importance of good temperature characteristics. Only watthour meters, which are completely compensated for both temperature variations and overloads, meet these requirements.

Sangamo Type HF meters are fully compensated for a high degree of accuracy up to three hundred percent load and for any temperature throughout Winter and Summer.

These facts do not suggest the obsoleting of all uncompensated meters; they do indicate the necessity of selecting only fully compensated meters on modern loads and where large variations in temperature occur.

Type HFA

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

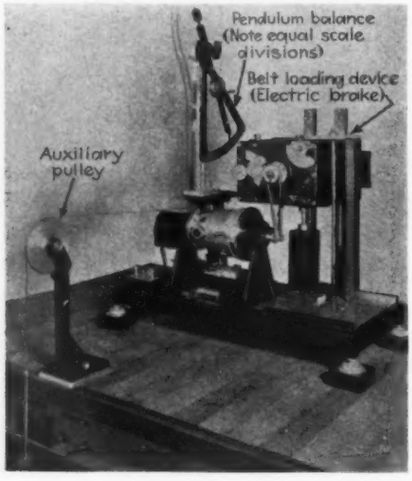
NEW ENGINEERING IDEAS

THEORY • DESIGN • MANUFACTURE • CONSTRUCTION • UTILIZATION

Small Transmission Dynamometer

By L. K. ACHESON
The Hoover Company, North Canton, Ohio

Sensitivity as close as 0.001 hp. has been attained in a line of small transmission type dynamometers developed at the Hoover electric cleaner plant. The maximum output of the one shown is 0.45 hp. Calibration tests have shown the unit to be accurate to within less than 1 per cent throughout the range of the uniform scale over which the pendulum torque-weighing arm operates. Interchangeable motors permit measurement in either medium-speed (1,000 to 4,500 r.p.m.) or high-speed (4,500 to 12,000 r.p.m.) ranges.



Sensitive transmission type dynamometer for fractional horsepower tests
Similar apparatus in vertical form has proved value in testing small fan systems.

Spring balance and beam type scales formerly used have been superseded by this new design. Three ranges, 0 to 5, 0 to 10 and 0 to 20 oz., may be obtained by adjusting the weight to top, middle or lower position on the pendulum arm. Uniform scale divisions result from the use of a cam over which the cord from the dynamometer pulley passes. Extreme care was exercised in machining the cam because precision of the whole device depends upon its accuracy.

Another factor recognized as promoting sensitivity was the use of mercury troughs in which carbon disks ride as a means of supplying current to the motor; drag on the dynamometer casing due to stiffness of copper lead wires was eliminated. Within the dynamometer motor the current was conducted from the carbon disks to field and armature by means of $\frac{1}{8}$-in. brass rods firmly imbedded in fiber along the motor axis. This eliminated possibility of change in static balance because of derangement of flexible wires. Still other sensitivity features were the precaution of "running in" the trunnion bearings in jewelers' rouge to remove any minute roughness on the bearing surfaces and the use of deflector vanes to render the fan exhaust radial and thus eliminate disturbing torque components.

The apparatus is adaptable to measurement of agitator and brush-roll power and to determination of transmission efficiency of small belt drives.

•

Rectifiers Become Mutators

In seeking a generic name for grid-controlled mercury valves, Brown, Boveri & Company, Ltd., have adopted the term "mutator" as one that can readily be converted into any language. Several functions can be performed by these large mercury-vapor valves and each has its commonly accepted name—rectifier, static converter, inverter, etc. But there has been no commonly accepted name covering all these uses; the Swiss firm henceforth will use "mutator" and hopes it will find acceptance.

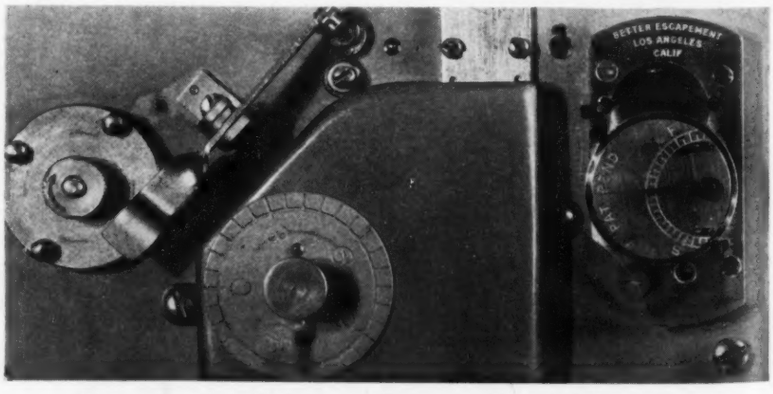
•

Escapement Betters Graphic Meter

By F. A. REDDING
Southern California Edison Company, Ltd., Alhambra, Calif.

As an outgrowth of a study on clocks and timing devices made by the meter committee of the Pacific Coast Electrical Association, a new clock escapement for the type RA graphic watt-hour meter has been developed. From an exchange of operating information among the various California utilities it appeared that restaking the brass bearings of the clock escapement not only involved considerable maintenance expense, but also resulted in the bearings often being out of line with regard to the steel pivots. It was suggested that jewel bearings be provided if possible and such bearings mounted on removable plates for easy replacement.

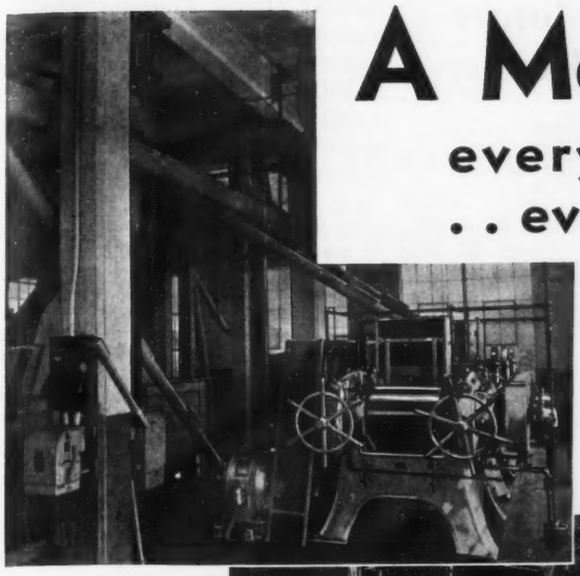
The investigation was carried out by members of various meter departments, technical information being supplied by a specialist in clock escapement problems. As a result, a



Escapement installed on a modern type RA graphic meter
Note the accessible adjustment arm on the device. The escapement can also be installed on the old-style clock of the RA meter

A Motor to Match

every Food Industry Drive .. every Type of Application



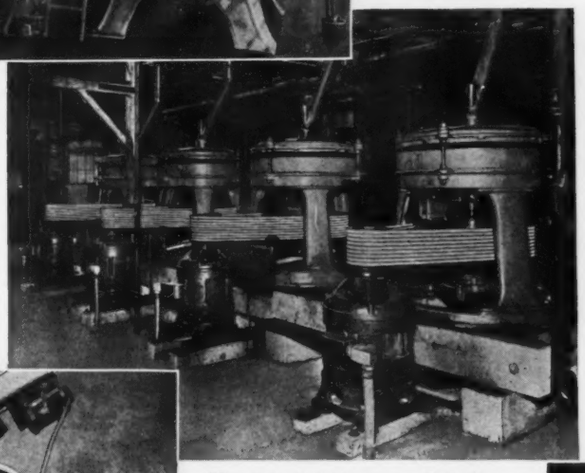
Squirrel Cage Motors driving Allis-Chalmers Flaking Rolls in a Tennessee Cereal Plant.

IN few industries are the requirements for motors driving processing machinery as varied as in the many branches of the Food Industries.

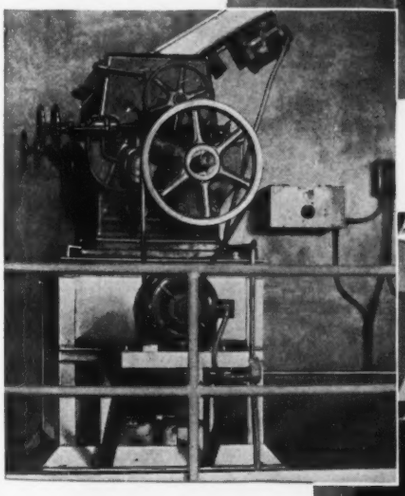
Protection from dust or moisture is necessary in many plants; the "washing down" of the machinery after a period of operation presents an extra hazard for motors, while the varied types of machinery used in the food plants necessitates motors not only of different mechanical but also of special electrical characteristics.

Allis-Chalmers motors are built in types, sizes and with special characteristics to meet these varied requirements.

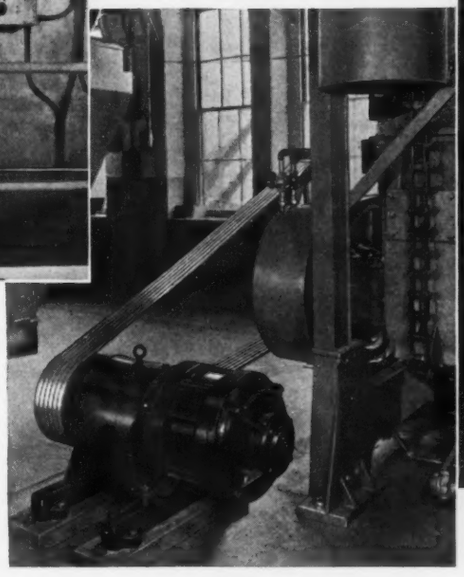
Allis-Chalmers district offices in all principal cities and many foreign countries will be pleased to assist in problems of motor application for standard or special drives.



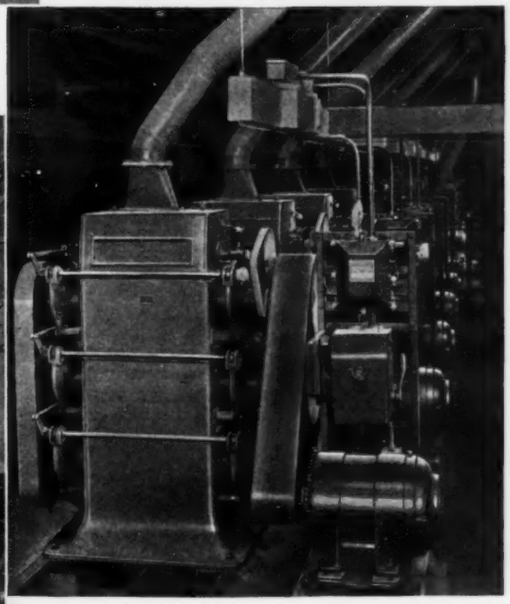
Vertical Motors driving Allis-Chalmers Under Runner Buhr Mills in an Indiana Starch Plant.



Driving an Allis-Chalmers Malt Crusher in a Milwaukee Brewery.



Gearmotor operating Rolls in a Chocolate Plant.



Enclosed Fan-Cooled Motors operating Allis-Chalmers Grinding Mills in a Peoria, Illinois, Distillery.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

new escapement, patented under the name "Better Escapement," has been developed which not only eliminates many of the troublesome problems involved, but goes beyond the suggested changes and provides a complete dust-proof interchangeable escapement guaranteed to give reliable operation. It consists of a balance assembly inclosed in a dust-proof case with an accessible adjustment arm. Temperature errors are eliminated by the use of an Elinvar balance and hairspring. Use of this escapement on a properly serviced timing device insures correct timing on the type RA meter for a minimum period of two years. The assembly is designed to fit either on an old-style clock or the more modern timing device used in this meter.

•

Interlock System Protects Workers

Consideration of the safety of employees has resulted in the use of a system of interlocks on switches, gates and apparatus in the high-tension research and testing laboratory of the Callenders Cable & Construction Company, London.

The focal point of the interlock system is the removable high-voltage link joining the terminals of the transformer to the sphere gap above the test floor. It is 10 ft. long in the case of the 500-kv. transformer and 20 ft. for the 1,000 kv. This removable link is the only high-voltage connection to the test area. When the link is in place safety depends upon the fact that all doors into the testing area must be closed before voltage can be supplied to the solenoid of the transformer-supply circuit breaker. The link is an obvious and visually conspicuous index of safety. Switches in the same circuit prevent the breaker from being closed if the overhead cranes have been left too close to the transformers, or if the alternator control has not been reduced to zero volts to prevent a surge occurring if a transformer is suddenly switched on the supply voltage.

Placing the removable high-voltage link on wall clamps, when not in use, operates switches which short circuit the door switches necessary to give free access to the test area. In this way free command of the transformer is regained so far as any other test area is concerned.

32-Cycle Reclosure of 110-Kv. Breaker

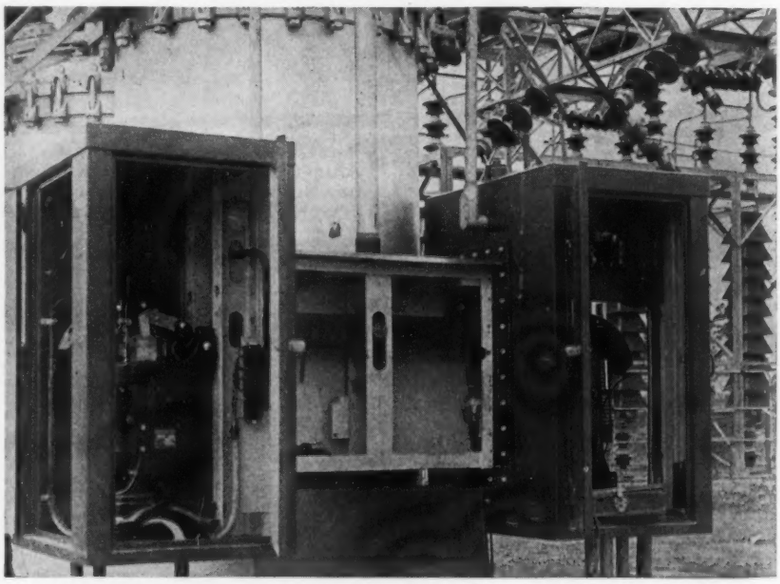
By J. H. PAGET
Superintendent Power Department,
Carolina Power & Light Company

In building a new 110-kv. transmission line between Laurinburg, N. C., and Wilmington, N. C., the Carolina Power & Light Company decided to test the reliability of a single line equipped with the latest protective devices. Expulsion protective gaps were installed on all insulation strings to take care of line-to-ground flashovers, which they clear in one-half cycle without operating any oil circuit breakers. At the Laurinburg end, where the line is connected into the present system, it was necessary to have an oil circuit breaker which would instantly close the line back in again after phase-to-phase faults.

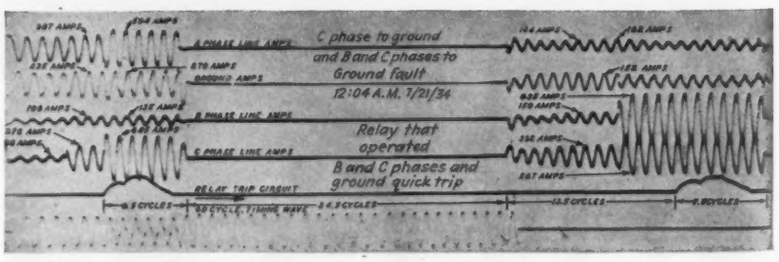
One of the breakers in this station was a General Electric 110-kv. type FHKO-139-54A-Y breaker operated by a type MK-4 motor mechanism. The General Electric Company agreed to modernize the breaker with oil-blast contacts for high-speed operation and to build an operating mechanism that would reclose the breaker contacts in approximately 30 cycles after the trip coil was energized.

The mechanism consists of two MK-4 motor mechanisms connected through a walking beam to the operating rod of the breaker. In this way either mechanism can close the breaker. The control permits the choice of either mechanism for the initial closing operation. With the breaker closed by one mechanism, the station operator can set up the reclosing circuit for the second mechanism. The breaker is tripped open on the occurrence of a fault, the opening motion closing an auxiliary switch which energizes the second mechanism. This mechanism, in the open position, immediately starts to close. In so doing it recloses the breaker independently of the position of the moving contact blade of the breaker or of the other mechanism. In fact, on the reclosing operation the reclosing mechanism works so fast that the moving contact blade has its motion reversed before it reaches the fully open position.

Oscillograph tests made after installation show that the breaker contacts reclose 32 cycles after the trip coil is energized. Seventeen breakers were so modernized.



Two MK-4 motor mechanisms through walking beam operate breaker



Trip and reclosure in 31 cycles

Oscillograph on switchboard at Laurinburg substation. Automatic tripping in 6.5 cycles after trip coil was energized and reclosure in 24.5 cycles after tripping.

FIFTY YEARS OF PROGRESS

IN 1885, fifty years ago, the American Telephone and Telegraph Company was formed.

There were few telephones then and service was slow, uncertain and limited to separate communities. In that year the largest number of telephones in any one city was 8400, in New York.

New York now has 1,500,000, Chicago 800,000, Philadelphia 350,000.

From your own Bell telephone you may talk with any one of 17,000,000 other telephones in this country and most of those in foreign lands. Today, 93% of all the world's telephones are within reach of the Bell telephone in your home or office.

This year marks also the Twentieth Anniversary of the opening of the first transcontinental line, from New York to San Francisco, and the Eighth Anniversary of the opening of transatlantic service.

The work of improving Bell telephone communication is never ended . . . it goes on and on toward a constantly higher standard. Further improvements as important as those of the past half-century will come through Bell System research, manufacturing and unified operation.

BELL TELEPHONE SYSTEM

To make your telephone service dependable, 94 per cent of the Bell System's 80,000,000 miles of wire is now in storm-resisting, lead-covered cable. Sixty-five per cent of it is buried beneath the ground.

A New Approach to the Farm Market

The Central Hudson Gas & Electric Corporation has worked out a highly organized method in developing the farm load. "Greater service representatives" call on each customer at least once a year. When they reach a farm they fill out a survey card from information supplied by the farmer and their own observations covering the operation on that farm and how it is equipped to handle the work.

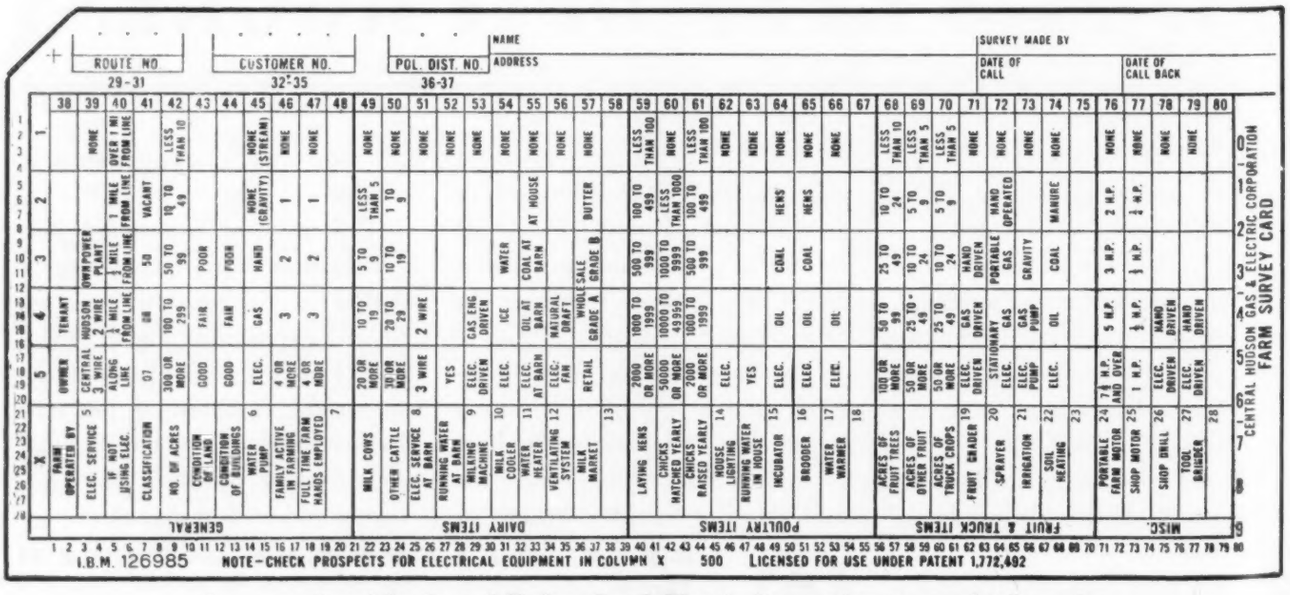
The information recorded covers the ownership of the farm and whether the farmer can be expected to make major capital expenditures, the condition of farm land and buildings, the present electric service capacity and the distance from distribution lines, the number in the family active in farming and the number of full-time hands employed. The next questions relate to the size of the dairy herd. If he is milking less than ten cows and lacks the acreage or building capacity for a larger herd the farmer is considered only a limited prospect. The market he serves determines how the milk is to be handled and the equipment required. Poultry is covered next—the number of hens, type of houses, incubators and brooders. Data on fruit farming and general power used on the farm follow.

With such a classification the utility has a background of valuable data of its rural customers' equipment now in use and possibilities for load development. Handled through the Hollerith machine, it is possible to make up prospect lists for all types of equipment, which are made available to the dealers. For example, farmers producing Grade A milk should have water heaters. Progressive farmers indicated by milking machines, running water in the dairies, large herds of milch cows, etc., are preferred prospects for advanced equipment. Opportunities for the sale of incubators or the lighting of poultry houses stand out prominently. And the "greater service man," calling back at regular intervals, gains the confidence of the farmer. Having nothing to sell, he takes on an advisory status and makes the utility an active, helpful influence in developing the business of the farm, out of which the load must grow.

Revenue from Metal Melting

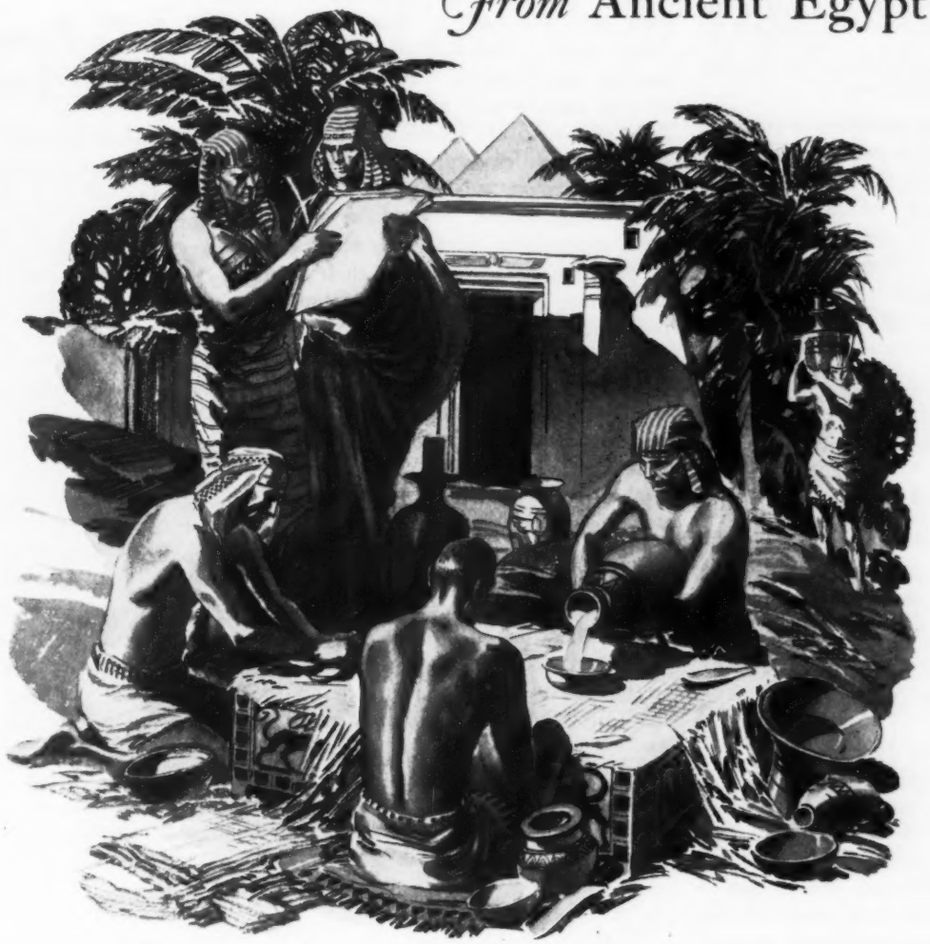
Ten steps to the development of a profitable metal melting load have been suggested by the Detroit Electric Furnace Company, after a field survey of the methods now in use by power companies which have become active in this field:

1. Assign one or two power engineers to talk with foundry executives and obtain a list of jobbing and industrial melters in the area served.
2. Hold meetings of utility men, foundry superintendents, metallurgists and design engineers of industrial concerns to discuss electric melting and electric heat treating and to see an exhibit.
3. Purchase a special semi - portable "loaner" furnace, a small production unit effective in helping the foundry man to sell himself on the advantages of electric melting. The furnace can be loaned or rented for three to six months to foundries in the district which are potential permanent users of electric furnace equipment.
4. Devise rates which encourage this desirable load—1½ cents or less per kilowatt-hour. Modify demand charges on furnace operation to permit electricity to compete with other fuels.
5. Finance the purchase of melting furnaces for operation on the lines.
6. Employ a trained metallurgist to work with customers.
7. Employ for a short time a designing



Survey card used by Central Hudson Gas & Electric Corporation to record information supplied by the farmer and gleaned from its own observations

From Ancient Egypt



More than 5000 years ago, an ancient Egyptian conceived the idea of working the fibres of the Papyrus plant into thin sheets. From this, came Paper, for recording our thoughts. And the Dark Ages began to grow lighter.

Likewise, as the discovery of paper was basic to civilized life, so was the discovery of Chromel, which gives Electric Heat to home and industry. This basic discovery of 1906 created today's electric range and all other heating devices, by providing the all-important heating element. Chromel has proved so good for this use, that nothing has ever taken its place . . . and endless research has continued to improve it. Today, it lasts more than twice as long as it did a few years ago. This is your assurance of your good judgment in putting your trust in devices that are Chromel equipped. Hoskins Manufacturing Co., Detroit, Mich.

H O S K I N S

CHROMEL

THE *wire* THAT MADE ELECTRIC HEAT POSSIBLE

engineer familiar with properties now obtainable with electric cast iron, heat treated, plain and alloyed, to stimulate its use.

8. Purchase a 25- to 50-lb. furnace to familiarize the company's staff with the easy operation and precise control of electric melting.

9. Specify electric iron when buying both iron and steel castings. Many of these can be changed to electric furnace iron at an actual saving in cost amounting to from 60 to 70 per cent.

10. Furnish the transformers for electric melting furnace installation.

Electric melting produces a revenue of from $6 to $10 per ton for iron and from $3 to $6 per ton for brass. The demand for electric melting usually occurs in dense population centers and the problem of power distribution is simple. The following table shows the potential revenue obtainable from furnaces of this type in the different sizes:

Furnace Size (Cold Charge Capacity) Lb.	Approximate† Monthly Kw.-Hr. Required	Estimated* Monthly Revenue at 1½ c. per Kw.-Hr.	Estimated Annual Revenue at 1½ c. per Kw.-Hr.
35	4,000	$ 60.00	$ 720.00
200	14,000	210.00	2,520.00
350	18,000	270.00	3,240.00
500	25,000	375.00	4,500.00
1,000	50,000	750.00	9,000.00
3,000	75,000	1,125.00	13,500.00

*Based on 20-day month
†Based on 8-hour day

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Customer Savings Build New Load

If one policy stands out more than another in sales organizations it is that salesmen will secure the best results if they consider the personal interests of customers and convince them of the user-benefits from purchased service and electrical applications. Recognizing that a pleased customer is the best prospect for extended usage of service, many power-sales organizations are aiding their customers to reduce their over-all unit production costs, improve quality, reduce rejects, increase uniformity and other things essential in a competitive market, by renovizing practices and equipment. Such aid may effect sufficient monetary benefits to the customer that he can be interested in other profitable uses of electric service.

Other companies have research organizations for developing and analyzing new uses like off-peak phosphate furnaces, burning high-temperature ceramics, etc. Some research is done on customers' premises to provide proof of commercial value. Often this involves a co-operative division of expense with the customer and manufacturer on the first installation.

Omaha Experience in Air Conditioning

In August, 1932, the Nebraska Power Company of Omaha organized its air-conditioning department. One man was assigned to this work to create interest and assist in air-conditioning installations. The first four or five months was spent in organizing a semi-monthly meeting of all men interested, building up a library, contacting furnace dealers, sheet metal men, refrigeration companies, architects, consulting engineers, etc., and helping the dealers educate their men and figure the jobs on which they are bidding.

The company has advertised actively to promote air conditioning by direct mail, newspapers, radio and talks before women's clubs and interested groups. Prospects are referred to the dealers selling the type of equipment suitable for the particular installation. Also, an engineer has been added to the personnel to work with the manufacturers and dealers and customers on specifications.

Sixteen installations were made up to the end of 1933 and last year 38, in the following classifications:

Type	No. of Installations —1933 and Prior	Hp.
Theaters	3	1,146
Restaurants	5	81
Stores	3	46
Offices	5	14
	16	1,287

Type	No. of Installations —1934	Hp.
Industrial	2	14½
Office	10	95½
Mortuaries	2	19
Stores	3	21
Theaters	1	85
Homes	12	22½
Restaurants	4	20½
Beauty parlors	1	30
Miscellaneous	3	36
	38	344

Omaha 1934 Air Conditioning Summary

	Units	Approx. Hp.	Approx. Selling Price	Estimated Annual Revenue
Furnace fans	340	85	$68,000	$5,100
Attic fans	60	12	1,200	480
Commercial exhaust fans	60	15	1,400	1,500
Domestic oil burners	430	108	129,000	4,300
Refrig. domestic cooling	12	23	7,200	1,460
Refrig. comm. cooling	26	321	97,000	5,985
Misc. washers, etc.	20	10	1,600	1,500
	948	574	$305,400	$20,325

The type of equipment used in the 1934 installations, number of units, horsepower, selling price and estimated annual revenue are shown in the accompanying tabulation.

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"Trial" Ranges Increase Usage

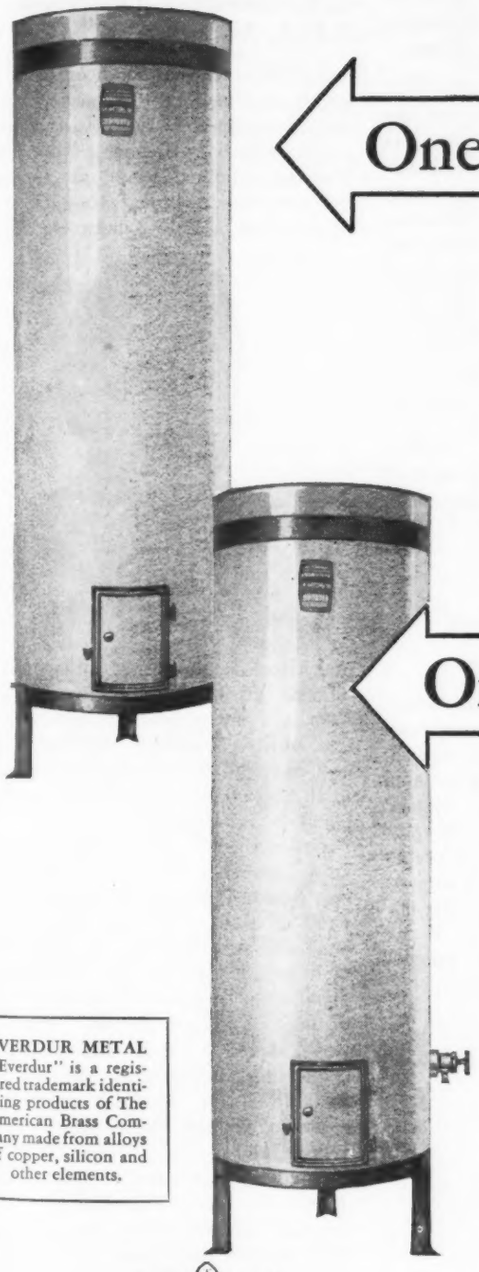
So marked has been the popularity of the 30 cents per week electric range trial plan of the Hartford Electric Light Company inaugurated in February, 1933, that the number of ranges on trial had increased from 1,121 at the close of 1933 to 1,747 at the end of 1934. In 1933, 308 ranges were sold and 618 in 1934 were purchased by residential customers. In the year just closed nearly all the ranges sold were put out by dealers and 351 represented ranges replacing the trial outfits. This demonstrates the very real sales value of the plan, according to Samuel Ferguson, chairman of the board of the Hartford company.

The average usage per residential customer at Hartford has increased from 280 kw.-hr. in 1921, when the promotional rate principle was established on the system, to 858 in 1934. In the past year there was a gain of 65 kw.-hr. per customer. The average price paid per residential kilowatt-hour has dropped since 1921 from 9.7 to 4.4 cents. There are now 5,896 electric ranges on the system, representing a saturation of 10 per cent. This density is bound to be much increased as the company's new "Share the Benefit" plan works out this year, the scheme being to furnish 50 kw.-hr. free per month for every 10 kw.-hr. used in excess of last year's consumption, month by month. Preliminary examination of the first month's results of this plan indicate that a substantial portion of the company's customers is already receiving some free kilowatt-hours, and it is confidently expected that more and more will be added monthly to those who find in this liberal offer a means to increase the comfort of their homes.

The use of electricity by Hartford company employees averaged 2,292 kw.-hr. in 1934, despite the fact that 30 per cent still do not utilize either an electric range, refrigerator or water heater. Of 575 employees, 331 use refrigeration, 300 ranges, 169 water heaters and 134 refrigeration, range and water heater in all-electric homes.

Identical?

Time will show that:



One is a *trouble-maker* *the tank will* RUST

The tank in this heater will give satisfactory service for a few years . . . until tank rust discolors the hot water, perhaps interferes with its steady use. And ultimately, when the tank fails, current consumption ceases until the heater is repaired or replaced. Meanwhile, profitless service calls . . . and a disgruntled customer who in the end spends more money than he "saved" at first by buying the rustable tanked heater. *Such equipment is wasteful, for the public and the utility as well.*

One is a *profit-maker* *the tank is* EVERDUR

The tank in this heater is made of *rustless* Everdur. It will give satisfactory service indefinitely. Current consumption will be uninterrupted . . . rust cannot interfere with its performance or shorten its life. Fewer service calls . . . satisfied customers. The slightly higher first-cost of the rust-proof tank is soon saved in freedom from upkeep expense. *Such equipment* . . . automatic electric water heaters with tanks of rustless Everdur . . . *is economical, for the public and the utility as well.*

EVERDUR METAL
"Everdur" is a registered trademark identifying products of The American Brass Company made from alloys of copper, silicon and other elements.

EVERDUR is copper . . . the traditional non-rust metal . . . alloyed in accordance with a special Anaconda formula. It is as strong and readily welded as steel, and lends itself to virtually one-piece tank construction. And Everdur cannot rust! Because of these properties, leading makers of automatic heaters and range boilers now standardize on Everdur for all their rust-proof models.

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities

EVERDUR METAL *for* TANKS

MEN OF THE INDUSTRY

H. E. Warren Awarded A.I.E.E. Lamme Medal

Henry E. Warren, president of the Warren Telechron Company, Ashland, Mass., has been awarded the 1934 Lamme Medal of the American Institute of Electrical Engineers "for outstanding contributions to the development of electric clocks and means for controlling central-station frequencies." Mr. Warren has been engaged since 1916 in adapting time-keeping synchronous motors to many fields of usefulness and in providing improved devices for frequency control. More than a hundred patents have been granted to him. During the past fifteen years he has served as president of the Warren Telechron Company and consulting engineer for the General Electric Company.

H. E. Warren

A graduate of the Massachusetts Institute of Technology, Mr. Warren obtained his early engineering experience with the Saginaw Valley Traction Company at Saginaw, Mich. Subsequently, while associated with the Lombard Governor Company in Boston and later in Ashland, Mass., he made improvements in the design of hydraulic speed governors which were installed in many of the largest water-power plants of the United States. As an avocation he spent considerable time and thought in designing and constructing various forms of electric clocks. After several years of experimenting the Warren Clock Company was organized in 1912.

Presentation of the medal will be made at the summer convention of the institute next June.

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► WILLIAM I. NICHOLS, formerly public relations counsel for Harvard University, and at one time promotion manager for the National Electric Power Company, has been appointed promotion manager for the Tennessee Valley Authority, with headquarters at Knoxville, Tenn.

► CLIFFORD F. HOOD, manager since 1933 of the Worcester, Mass., district of the American Steel & Wire Company, has been appointed vice-president in charge of operations, succeeding J. L. Perry, who has been transferred to Birmingham, Ala., as president of the Tennessee Coal, Iron & Railroad Company. Mr. Hood entered the electrical industry in 1915, upon graduating from Purdue University, as an employee of the Packard Electric Company, Warren, Ohio. Two years later he became identified with the wire company. CARL I. COLLINS, superintendent of the Cuyahoga (Ohio) Works, has been appointed manager of the Worcester district. He has been connected with American Steel & Wire since 1923.

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C. S. Herrmann Assumes New Executive Duties

Carl S. Herrmann, who was elected president of the New England Power Association (ELECTRICAL WORLD, February 16, page 46) has been for 22 years associated with the companies forming the system. He was born at Worcester, Mass., 44 years ago and entered business as a bookkeeper for the American Steel & Wire Company in that city. In 1912 he entered the employ of the then Connecticut River Transmission Company at Worcester; became assistant to Samuel C. Moore, then chief accountant, and when Mr. Moore was made general manager in 1914 assumed his former responsibilities. From that time Mr. Herrmann has been the chief financial officer of the system, and has been treasurer since the formation of the association in 1926.

C. S. Herrmann

C. E. Greenwood Receives F.H.A. Assignment

C. Ernest Greenwood, commercial director of the Edison Electric Institute, has been named assistant to the director of the industries division of the Federal Housing Administration. As adviser in the government organization, his work is to act as a liaison between the Federal Housing Administration and the electric utilities. Mr. Greenwood has been actively connected with the electric utility companies for many years and has had broad national experience in the marketing of electricity and electrical contrivances.

C. E. Greenwood

Following his graduation from Harvard University, he was connected with the Edison Electric Illuminating Company of Boston on rate analysis problems and new building equipment. He later became head of the merchandising department, which operated 30 stores throughout greater Boston. Mr. Greenwood served as chairman of the merchandising department of the Joint Committee for Business Development organized by the electrical industry following the economic depression of 1921. He became interested in wider national distribution of electrical equipment through different trade channels, and in 1926 inaugurated trade conferences between the associations representing six classes of retail outlets which resulted in a declaration of merchandising principles adopted by all groups.

In 1928 he joined the National Electric Light Association in New York to establish the commercial department of that organization. At the time of dissolution of that association, in 1933, he joined the Edison Electric Institute as commercial director, the position he now holds.

Mr. Greenwood is the author of many

articles and pamphlets concerning the problems of load building in the electric utility field.

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Detroit Edison Elects Three New Vice-Presidents

At the annual meeting of the Detroit Edison Company Edward T. Gushee, James W. Parker and Philip J. Savage were elected vice-presidents of the company. All of the officers of the company were re-elected with the exception of James V. Oxtoby, formerly vice-president and counsel, who continues as counsel. This change was made at Mr. Oxtoby's request.

Mr. Parker has to his credit many years of fruitful service with the Detroit utility. A graduate of Cornell University, class of 1908, he served an apprenticeship of one year as plant operating engineer for the DeKalb (Ill.) Power & Light Company and another year as chief operating engineer for the Vincennes (Ind.) Street Railway Com-

J. W. Parker

pany. Then he moved to Detroit to take a position as boiler room engineer with the Detroit Edison Company. Since that time he has advanced through responsible positions to his present place as chief engineer and assistant to general manager, in which position he will continue. Mr. Parker is a member of the Detroit Engineering Society and the American Society of Mechanical Engineers.

Mr. Gushee has been connected with the Detroit Edison organization since 1920, when he entered the inspection division of the purchasing department. Subsequently he was promoted to purchasing agent of the company, in which position he will continue.

Mr. Savage entered the employ of the Detroit Edison Company in 1910. For several years he served as a power sales engineer and in 1917 was appointed assistant to general manager.

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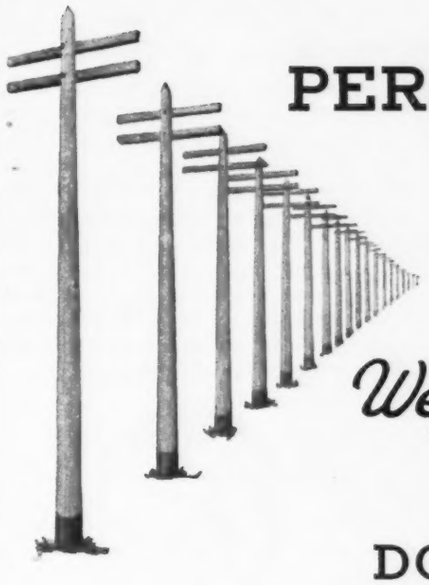
▶ THOMAS EVANS, president of Merchant & Evans, Philadelphia, has been elected chairman of the refrigeration division of



PERSONALITY?

POLES PILING

Weyerhaeuser

Poles

DO Stand Out From Others

● Clean-cut workmanship and dependable uniformity are evidences of the care with which Weyerhaeuser poles are selected, cut, seasoned, treated, finished and graded for your use. Many of these qualities are apparent at first inspection. Others show up best after many years of service.

Call it personality or what you will — Weyerhaeuser Western Red Cedar poles have the qualities that make for utmost economy and service in line construction.

These qualities and the methods that produce them are clearly explained in the Weyerhaeuser Pole booklet. It contains valuable information for men charged with the responsibility of buying poles. Your copy mailed on request.

POLE AND PILING DIVISION
Weyerhaeuser Sales Company

Executive Offices
FIRST NATIONAL BANK BUILDING, SAINT PAUL MINNESOTA

Branch Offices

Tacoma Building, Tacoma, Washington
Lewiston, Idaho
P. O. Drawer 629, Newark, New Jersey

ALSO REPRESENTED BY WESTINGHOUSE ELECTRIC SUPPLY CO.
Detroit Chicago St. Louis

the National Electrical Manufacturers Association and chairman of the household refrigeration section to succeed the late Geoffrey M. Johnston.

▶ CHARLES R. HOWE has been elected chairman of the Arizona Corporation Commission.

▶ LEE H. HUNTLEY, construction superintendent of Joe Wheeler Dam, has been appointed to a similar position on the Pickwick Landing Dam. GEORGE P. JESSUP of New York was named to the position at Wheeler Dam.

▶ REESE MILLS, manager of the range division of the Westinghouse Electric & Manufacturing Company, Mansfield, has been elected chairman of the electric range section of the National Electrical Manufacturers Association to succeed A. L. Smith of the Walker & Pratt Manufacturing Company.

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F. D. Comerford Elected President of Boston Edison

Frank D. Comerford, who was elected president of the Edison Electric Illuminating Company of Boston (ELECTRICAL WORLD, February 16, page 46), has become one of the best known utility executives in the East during the past seven years. A native of Worcester, Mass., he was graduated from the Harvard Law School in 1917, became a partner in the Boston firm of Ropes, Gray, Boyden & Perkins in 1924, and succeeded Henry I. Harriman as president of the New England Power Association in 1927. Upon the death of the late Charles L. Edgar, for many years president of the Boston Edison company, Mr. Comerford was

F. D. Comerford

made chairman of the Power Association board. His grasp of public relations, finance and executive capacity have been outstanding features of his administration. He will retain the chairmanship of the board of directors of the New England Power Association and continue to direct its policies while applying himself to the active management of the Edison company.

W. H. Taylor Heads Illuminating Companies

William H. Taylor, president of the Philadelphia Electric Company, was elected president of the Association of Edison Illuminating Companies at its recent meeting in Florida. Mr. Taylor became chief executive of the Philadelphia utility in 1928, after spending 24 years in the United Gas Improvement Company's engineering, management and construction departments. He first engaged in field work in electric and gas construction and subsequently served as operating head of

W. H. Taylor

U.G.I. properties in Gloversville, N. Y.; Charleston, S. C., and Omaha, Neb. In 1922 he was sent South again as executive assistant with the Georgia Railway & Power Company, the following year becoming its vice-president. His Atlanta experience ended when he returned to Philadelphia in 1927 as vice-president of the United Gas Improvement Company in charge of operations.

Mr. Taylor is an authority on utility rates and service. He has testified frequently as an expert on these subjects before public service commissions and federal courts. He is a trustee of the Edison Electric Institute and of the Stevens Institute of Technology, his alma mater; chairman of the board of the Electrical Testing Laboratories and a member of the Electrical Association of Philadelphia and the Illuminating Engineering Society.

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▶ JAMES G. BIDDLE of Philadelphia, well-known manufacturer of precision electrical and scientific instruments, celebrated the fortieth anniversary of the founding of his business on February 21. Mr. Biddle's career has paralleled the amazing growth of the electrical industry during the past forty years and from his intimate knowledge of electrical and scientific instruments, both in this country and abroad, he has made a definite contribution, especially in the field of simplified testing devices.

▶ JOHN F. SHAUGHNESSY, for fifteen years chairman of the Nevada Public Service Commission and a member of that commission since 1907, has retired from office upon the election of his successor, HARLEY A. HARMON of Las Vegas. Mr. Shaughnessy has a distinguished record as a commissioner. He has been prominent in the National Association of Railroad and Utilities Commissioners for 25 years and served as president in 1927. Mr. Harmon, who succeeds Mr. Shaughnessy, is a leading lawyer in Nevada.

▶ AMBROSE SWASEY, chairman of the board the Warner & Swasey Company, has been made the recipient of the Washington Award for 1935. Doctor Swasey, famous manufacturer of precision instruments and mechanisms, has long been devoted to furthering the advancement of the engineering profession. Formal presentation of this award of the Western Society of Engineers was held in Chicago February 20.

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R. B. Grove Elected Executive Vice-President

Robert B. Grove, vice-president of the New York Edison Company and the United Electric Light & Power Company, was elected executive vice-president of both companies at the annual organization meetings of directors on February 5 and 19. Mr. Grove also was elected a director of the New York Edison Company. He has been a director of the United company since 1931 and of the Brooklyn Edison Company since 1933. Mr. Grove is best known nationally in the electric light and power industry through his committee work in the N.E.L.A. and his activity in connection with the annual convention held by that body and its successor, the Edison Electric Institute.

OBITUARY

▶ ALFRED W. KIDDLE, New York patent attorney and an Edison Pioneer, died, of a heart ailment, January 7 at his home in New York. For a number of years Mr. Kiddle was associated with the late Thomas A. Edison, for whom he handled a number of patents. At the time of his death Mr. Kiddle was a member of the law firm of Kiddle, Bethell, Montgomery & Halbert. He was in his seventieth year.

▶ LESLIE L. PERRY, advisory electrical engineer for Sargent & Lundy, Chicago, died suddenly, February 1, at Cuttingsville, Vermont, in his sixty-second year. Mr. Perry's early work in the engineering field was with the extensive power generation and distribution interests of the late Dr. F. S. Pearson, his activities taking him on extended trips to Canada, Mexico, Brazil, Argentina and various countries of Europe. From 1897 to 1900 and again from

1909 to 1911 he was with the General Electric Company at Schenectady. During the past 24 years he had been connected with Sargent & Lundy. Mr. Perry was a fellow of the American Institute of Electrical Engineers and a member of the Western Society of Engineers. To these organizations he contributed numerous papers and reports based on his wide knowledge of and first-hand experiences in his chosen field. These organizations, in turn, honored him with appointments to various important committees.

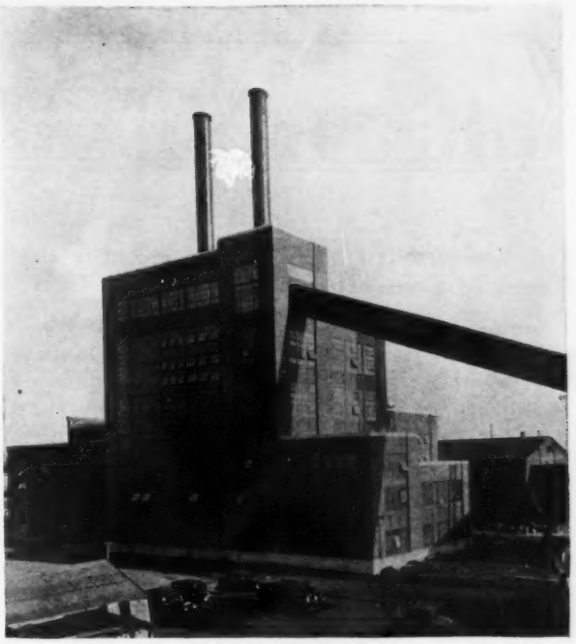
▶ PHILANDER NORTON, assistant to the president of the Bell Telephone Laboratories, died January 10, of pneumonia, at Port Washington, Long Island, in his fifty-fourth year. Mr. Norton was a member of of the American Institute of Electrical Engineers.

▶ EDGAR J. ALLEGAERT, vice-president in charge of operation of the electric department of the Public Service Electric & Gas Company, Newark, N. J., died at his home in that city February 26, after an illness of two months. Mr. Allegaert had been identified with the Public Service Company and its predecessor companies continuously since 1899. He became vice-president of Public Service in charge of electrical operations in 1924. Mr. Allegaert was 69 years of age.

▶ JOHN F. KELLY, managing director of the Association of Iron and Steel Electrical Engineers and editor of *Iron and Steel Engineer*, died November 16. Mr. Kelly was one of the best-known figures in the iron and steel industry and had long been active in advancing the interests of electrical engineers in that industry and in encouraging the application of electrical methods. He was born in McKeesport, Pa., in 1880. Mr. Kelly was formerly associated with various steel mills in the Pittsburgh district, with the Westinghouse Electric & Manufacturing Company and the National Tube Company.

▶ CHARLES S. BANGHART, vice-president and general manager for the Binghamton district of the New York State Electric & Gas Corporation, died in his sleep at his home in that city, February 26, in his sixty-third year. Mr. Banghart was president of the Metropolitan Edison Company and the New Jersey Power & Light Company in 1933, when he resigned to go to Binghamton. He became associated with the electrical industry in 1892 when he entered the employ of the Thomson-Houston Electric Company to electrify the street-railway system at Allentown, Pa., and from that year until 1914 he engaged in railway work. Subsequently he held executive positions with the railway and electric company at Binghamton, the Augusta-Aiken Railway & Electric Company in Georgia and the Staten Island Edison Corporation.

One of the two modern power plants recently built by the Forstmann Woolen Company to provide power for its mills at Passaic and at Garfield, N. J. A 60-cell Exide Battery at each plant operates oil-circuit breakers and furnishes emergency protection.



NRA CODE

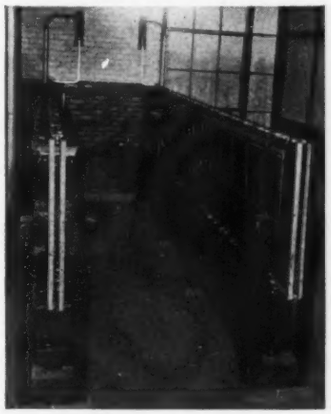
Strictly Modern—Including Power Protection by Exides

THE engineering profession has nothing more modern to offer than the recently built power plants of the Forstmann Woolen Company at Passaic and at Garfield, N. J., where the Company's two mills are located.

These power plants by means of oil circuit breakers control the power furnished to the mills.

To operate these remote-controlled circuit breakers, a 60-cell Exide Battery (floated across motor generator set) has been installed at each power plant. Not only do these batteries take care of circuit breaker operation, but in addition, each operates remote-controlled electrically-operated valve motors and pilot lights. In emergencies they also will provide an emergency lighting load of 35 amperes for three hours and operate three motors and magnetic separators for twelve hours.

The steadily increasing use of Exide Batteries for tasks that demand absolute dependability, is most significant. Let us tell you what Exides can do for your plant.



Sixty-cell Exide Battery of 320 amp. hr. capacity, at one of the Forstmann plants. A similar battery is used at the other plant.

Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY CO.
PHILADELPHIA

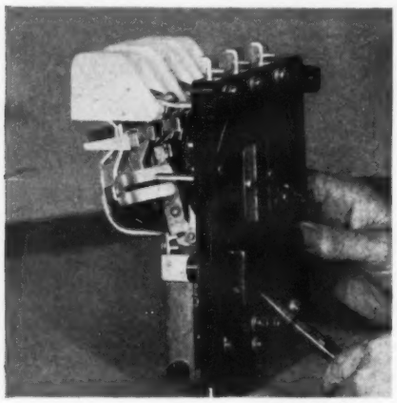
The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

NEW EQUIPMENT

Arc Arrester for Magnetic Controllers

An "arc arrester" is a recent development of the Westinghouse Electric & Manufacturing Company. The device, for mounting on the base of a contactor or linestarter, involves a small unit consisting of a capacitor and resistor connected across the poles on the load side of the contacting device. Oscillograms show less than one-half cycle arcing with the arrester.



Westinghouse

Only one unit is required for a three-phase contactor and relief is afforded not only for the contactor, or linestarter upon which it is mounted, but also for any disconnect, operating switch, fuse or other rupturing device connected ahead of the contactor.

•

Motor With Magnetic Brake

Electric Specialty Company, Stamford, Conn., announces motors with brakes for use on hoists, winches, cranes and other applications. When no electrical power is applied to the motor terminals springs press the stationary and rotating disks together. Suitable brake linings are used on the rotating disks which are mounted on the motor shaft. As electrical power is applied to the motor, electromagnets counteract the action of the springs and release the braking pressure on the disks, allowing the motor to rotate freely. These brakes are furnished built into a.c. and d.c. motors of single, multiple and variable speed.

Electric Specialty Co.

•

Electric Governor Controls Motor Speed

Constant speed combined with light weight and power of series, universal motors is claimed for the new types of "Dumore" electric governor-controlled motors announced by the Dumore Company, Racine, Wis.

Two types are offered, adjustable type, speed varied while motor is operating, and fixed type, adjusted while motor is at standstill. Three sizes in each of the two types are available for controlling speed of motors rated 1/64 to 1/8 hp. over a range of approximately 1,000 to 7,500 r.p.m.

Electric governor-controlled motors are especially well adapted for operating the new portable talking motion-picture projectors, scientific instruments, apparatus where quick acceleration is required, yet where constant speed under varying load is necessary, it is stated.

•

Motor-Driven Grab Bucket

Improved motor-driven grab buckets ranging from ½ to 3 cu.yd. capacity for steel mills, foundries, power houses and material yards handling Vermilion ore, limestone, dolomite, slag, sand, cinder, clay, coal and similar bulk materials are announced by Erie Steel Construction Company, Erie, Pa. With special d.c. Westinghouse control the use of only two conductors between the control cab and bucket is made possible.

Since each bucket carries its own Westinghouse crane motor, brake and gearing in the bucket, the buckets can be attached to cranes, monorail hoists or any hoisting equipment when electric power is available. The unit is self-contained and there is no tendency to lift out of the material while closing and it digs itself in without being dropped. The whole or any part of the load can be emptied and the bucket cannot open until the current is applied.

Portable Potentiometer

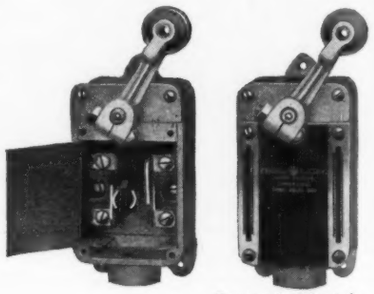
Portable potentiometer designed to enable pyrometer users to check potentiometers, millivoltmeters and thermocouples quickly and accurately has been announced by the Brown Instrument Company, Philadelphia, Pa. The combination of a step-switch and slide wire makes it possible to read the indicating scale to 0.01 millivolt over a total range to 71 millivolts. A fully inclosed, suspension type galvanometer is used. Having a very short period (approximately two seconds), readings can be taken rapidly, as the galvanometer responds immediately when dial is moved to a new position. Two sets of binding posts and a toggle switch, provided for thermocouple checking, further facilitates taking check readings quickly and accurately.

Brown Instrument

•

Track-type Limit Switch

Small, track-type, spring-return limit switch, intended for use in making or breaking control or indicating circuits at a fixed point in the travel of a part of a machine or mechanism, has been announced by the General Electric Company. The switch, designated as



General Electric

★

Close tolerances made possible *by Bakelite Molded*

IN THE terminal block illustrated measuring 12⅛″ x 2½″ x 1⁵⁄₁₆″ very close overall tolerances were specified. To meet the exacting specifications for this intricate part required not only skilful molding but also the use of a molding material that combined the proper flow point with a reasonably quick cure. The right material was found in Bakelite Molded.

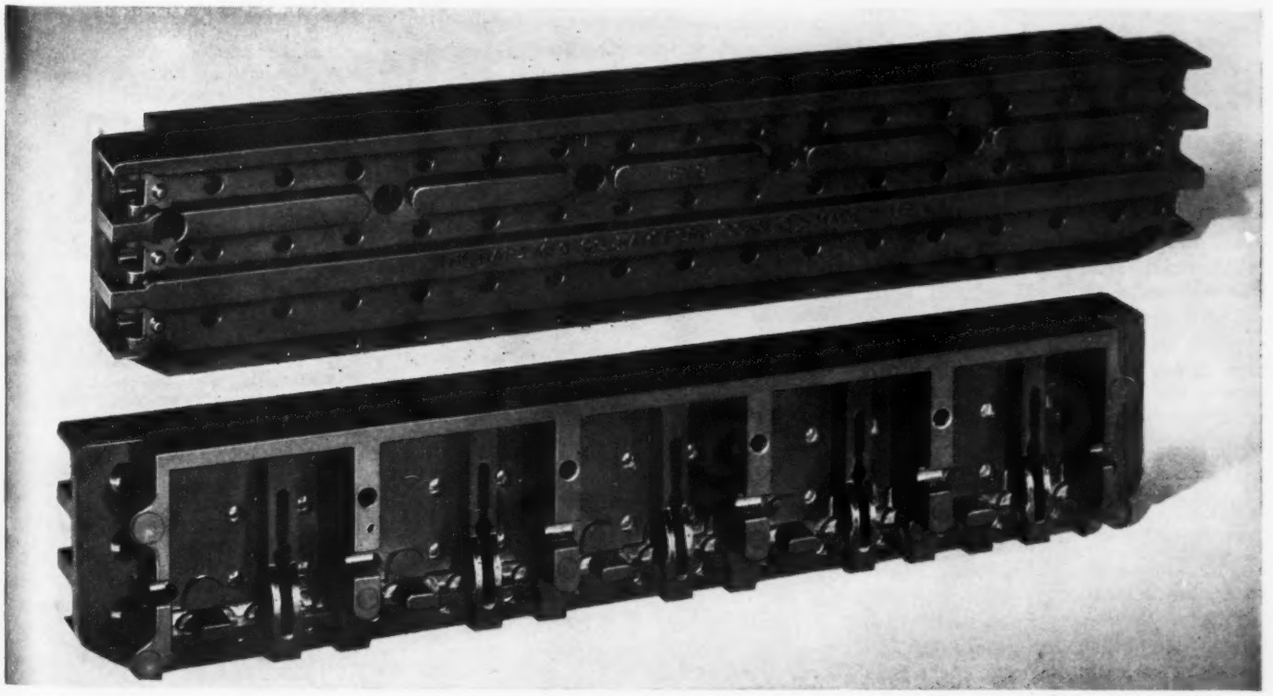
This terminal block has over 150 bottomed holes, and numerous lugs, bosses, ribs, channels and deep recesses, all of which are accurately formed and positioned in the molding operation. The necessary relief lettering and markings were also formed in the same operation, the block leaving the mold a completed part with permanently lustrous finish and color.

Bakelite Molding Material is made to a number of different specifications so that the right formula is available to meet the particular requirements of a given molding job. All of these materials, however, possess high insulation value, are very strong, and are resistant to heat and cold, moisture, oils, weak alkaline solutions and most chemicals and acids.

Bakelite Molded insulations possess many advantages over porcelain, glass, rubber, fibre and other insulations for numerous purposes. It is possible that your own product could be improved through their use and we would be glad to cooperate with you in adapting them to your particular needs. We also invite you to write for copy of our illustrated descriptive booklet 3M, "Bakelite Molded". It contains much helpful information.

★

Photograph shows terminal block formed of Bakelite Molded for Hart Mfg. Co., Hartford, Conn. by Waterbury Button Co., Waterbury, Conn.



BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U.S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES

CR9440-A1A, has one normally open and one normally closed circuit. Its maximum carrying and breaking capacity is 5 amp. at 550 volts a.c., and on d.c. ranges upward from 0.4 amp. at 550 volts to 2.0 amp. at 115 volts.

•

Solderless Connector

Switch and Panel Division, Square D Company, Detroit, announces a solderless connector which consists of a copper cup with inclosing sides and raised lip of curved contour at the wire entrance and a specially designed nut and stud. The design insures a positive, permanent connection and is made in two sizes —for nominal 60 amp. and 100 amp.

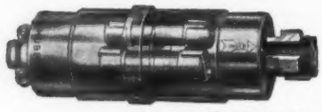
•

"WELD-O-METER," a quick-reference circular disk chart that tells the correct type of equipment and the right control settings to use for spot- or flash-welding any gage metal at any required production rate, has been issued by the Thomson-Gibb Electric Welding Company, Lynn, Mass.

•

Polarized Fusible Caps

Harvey Hubbell, Inc., Bridgeport, Conn., has announced a new line of three-wire and four-wire polarized fusible caps as part of its "Hubbellock"



Harvey Hubbell, Inc.

line. The four-wire size is designed to take three standard 0-30 amp., 250-volt cartridge fuses and the three-wire size will receive two standard 0-15 amp., 250-volt cartridge fuses. Polarization is positive and prevents the insertion of caps in any but the right position, it is stated.

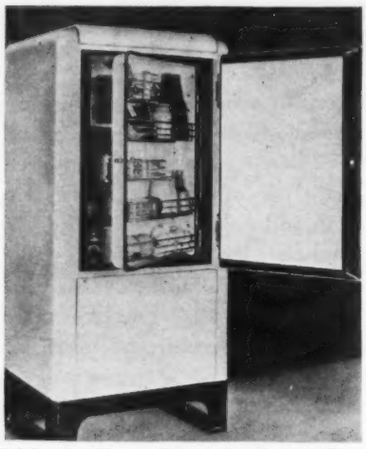
•

Thrustor-Equipped Flatplate Ironer

Thrustor-equipped automatic flatplate ironer, designated as model AF-10, has been announced by the General Electric Company. At a mere touch of the control on this appliance the "Thrustor," a motor-driven hydraulic device, produces the required pressing force and provides a smooth, cushioned return of the ironing buck to its open position, it is claimed. Because of the hydraulic action of this unit, uniform pressure is obtained regardless of the thickness being ironed, or the condition of the padding on the ironer. Moreover, fabrics are protected against scorching, in case of power-supply failure, because the return stroke of the buck is at all times assured.

Electric Refrigerator Has Additional Storage Space

Fairbanks-Morse Home Appliances, Inc., Chicago, Ill., announces a new line of electric refrigerators. The "Conservador" feature is entirely new, offering additional storage space for food



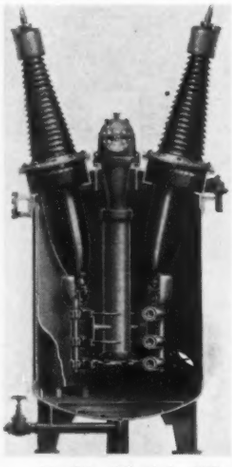
Fairbanks-Morse Home Appliances, Inc.

items without the necessity of opening the inner compartment of the refrigerator. Food in the "Conservador" may be separated as to the frequency of use and amount of cold required, a saving of time and energy consumption. Within the main, electrically lighted food compartment a temperature control is provided with automatic regulation of each of the eleven positions. The cooling unit is centrally located, providing storage on either side for tall bottles.

•

Expulsion Oil Circuit Breaker

Pacific Electric Manufacturing Corporation, San Francisco, Calif., announces an expulsion oil circuit breaker



Pacific Electric Mfg.

which though it retains the horizontal multi-break principle is also equipped with expulsion contacts to reduce arcing times, contact burning and oil deterioration. The new breaker is available in standard ratings from 15,000 to 287,000 volts. By the installation of expulsion contacts in Pacific breakers already in service it is claimed that interrupting capacities can be increased and maintenance expense reduced.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

A bulletin, "Ventilation Reduced to Package Form," which gives the construction details, applications and typical installations of Reed unit fans, has been issued by Reed Unit Fans, Inc., 730 St. Charles Street, New Orleans.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued a new bulletin (No. 1170) containing 27 pages of construction, operation and assembly details and engineering information on its automatic feeder-voltage regulator, type AFR.

The historical development, electrical and physical characteristics, test curves and engineering information applying to anhydrex rubber insulation is included in a 16-page bulletin published by the Simplex Wire & Cable Company, 72 Sidney Street, Cambridge A, Boston.

"Graphic Instruments in Industrial Research" is the title of a new publication of the Esterline-Angus Company, Indianapolis, Ind. This bulletin describes the use of graphic instruments in the testing of brakes and brake lining in the plant of the American Brakeblok Corporation, Detroit, Mich.

A condensed catalog, in pamphlet form, on Bundy connectors has been published by the Bundy Engineering Company, 305 E. 45th Street, N. Y. C.

"General Electric Arc Welders" is the title of a new bulletin issued by the General Electric company, covering operation, maintenance, assembly details and current oscillograms for portable arc welders.

Leach Relay Company, Los Angeles, Calif., has published a new catalogue containing circuit applications and specifications for its impulse, radio, telegraph and telephone relays.

"Ajax Insulating Varnishes and Compounds," a 42-page catalogue containing useful engineering tables and information on appropriate applications has been published by the Sherwin-Williams Company, 101 Prospect Avenue, Cleveland.

Applications, characteristics, chemical contents and current and voltage values for G. E. welding electrodes are given in a condensed catalogue published by the General Electric Company entitled "Welding Electrodes and Accessories."

A pamphlet supplement WG-1804 to catalogue WG-1803 describing application, assembly and structural design details of Yarway water columns and gages has been issued by Yarnall-Waring Company, Chestnut Hill, Philadelphia.

The Canadian Engineering Standards Association is issuing Part I of the Canadian Electrical Code, as the Canadian Standard for 1935. The book (170 pages) covers the essential requirements and minimum standards governing electrical installation up to 5,000 volts. Copies may be obtained for 25 cents from the secretary of the association, Room 3064, National Research Building, Ottawa.

Sales Up 20 per Cent in 1934

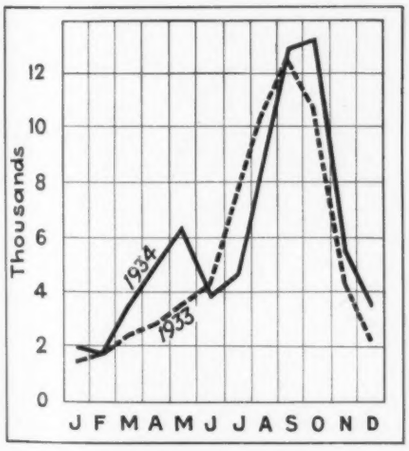
Estimated sales of wholesalers of electrical goods rose 20 per cent in 1934 compared with 1933, according to a statement by the Director of the Bureau of Foreign and Domestic Commerce. Based on the most reliable wholesale trade statistics currently available for the first eleven months of 1934, each of the major trades increased its sales over 1933, the average for all classes being 13.5 per cent.

The decline from the high point of 1929 has been definitely checked. Wholesale trade in general in 1933 was only 44 per cent of the 1929 value, but in some lines the decline was much more severe. Wholesalers engaged in the distribution of durable goods, such as lumber and building materials, metals and electrical goods, suffered the greatest decreases—78, 76 and 67 per cent respectively. In this group recovery in electrical goods has been much greater than in lumber and building materials.

•

Oil Burner Sales Rise

Shipments of domestic oil burners using mechanical draft in 1934 exceeded those of 1933 by 10 per cent, according to a



Domestic oil burners
Monthly shipments in the United States

report by the Bureau of the Census based on returns by 149 manufacturers. The totals were 70,860 and 64,446. Gains in industrial and boiler-burner units were larger, the aggregate for all types, including shipments outside of the country, having risen 19 per cent from 83,130 to 98,846.

•

Code Amendments Approved

Approval of eight additional articles submitted as amendments to the code for the portable electric lamp and shade industry, a subdivision of the electrical manufacturing industry code, has been announced by the N.I.R.B.

R&I.E. *Live Line*

INSULATOR TESTER

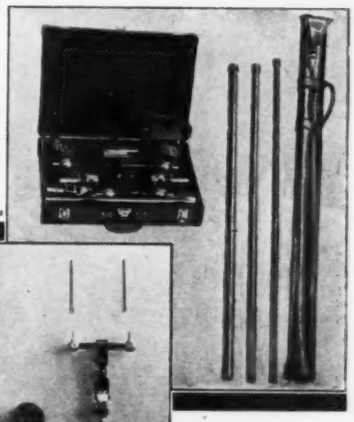
• is •

EASY TO USE » » FOOL-PROOF AND ABSOLUTELY SAFE

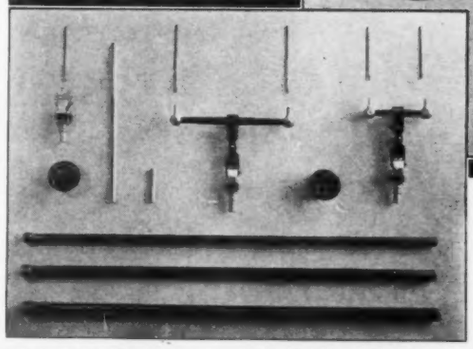
YOU can't tell the exact condition of any unit of a stack or strain unless you TEST it with a reliable tester. When the unit is defective you can then remove it.

Here is what the R. & I. E. Tester means to your property. It saves you trouble and expense.

- Eliminates annoying radio interference.
- Helps guarantee continuity of service.
- Removes only defective insulator units.
- Records rate of deterioration of each unit.
- Shows type of insulators best suited for your system.
- Improves customer goodwill and maintains revenue.
- Reduces maintenance costs by finding the cause of failure before it happens.



Above—Insulators are tested by making use of the operating voltage to produce a visible deflection of an instrument needle, such deflection indicating the condition of the insulator under test.



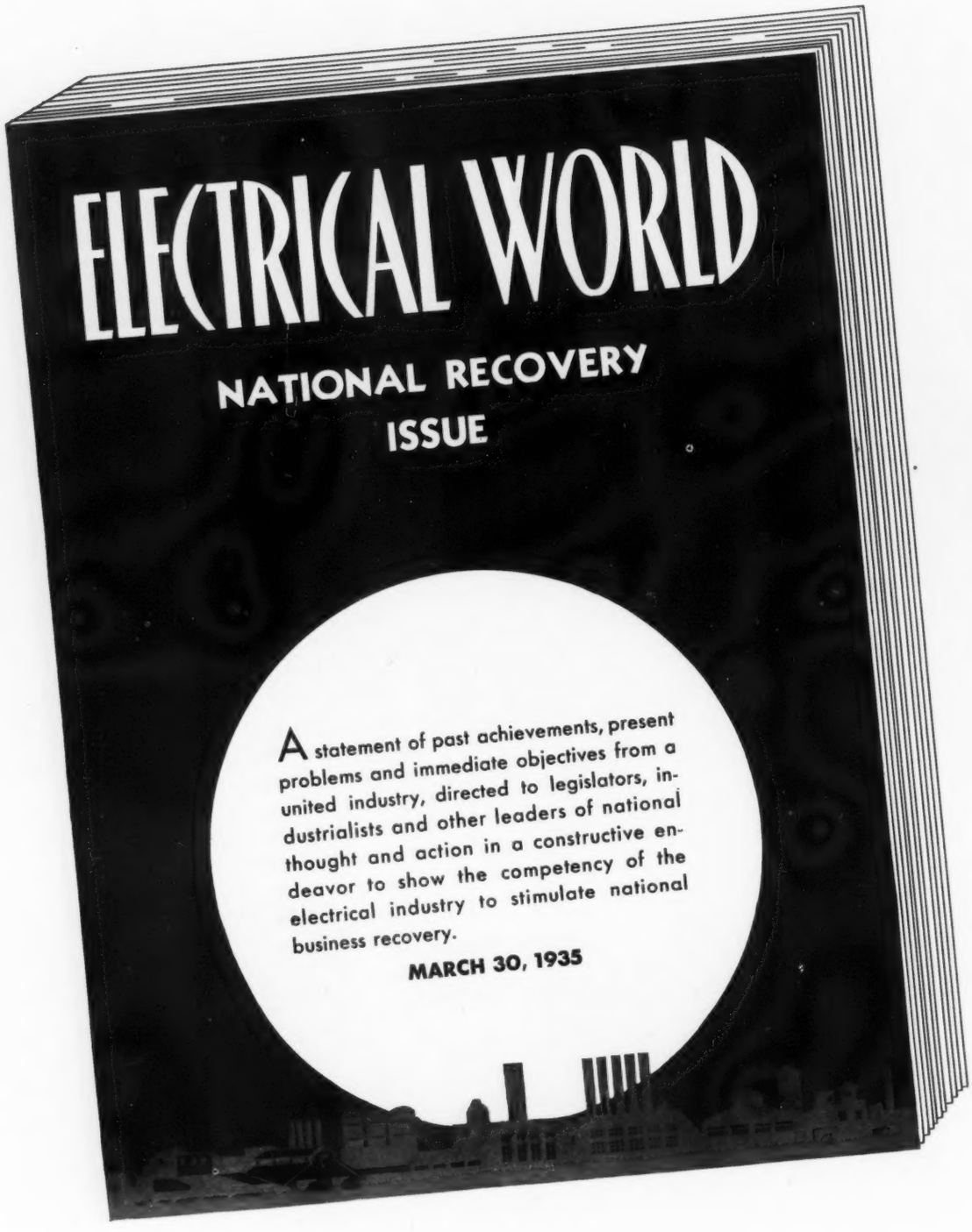
Left—Compact carrying cases—for handle and instruments. They are mechanically rugged, simple in construction and light in weight.

Left—The Insulator Tester complete is provided with three different heads to fit all of the wide variety of insulators which may be encountered. For special conditions where possibly only one or two types of insulators are to be tested, only one head may be needed.

RAILWAY AND INDUSTRIAL ENGINEERING CO.
GREENSBURG, PA.

NEW YORK BOSTON PHILADELPHIA PITTSBURGH CHICAGO ST. LOUIS BUFFALO
BIRMINGHAM DENVER INDIANAPOLIS KANSAS CITY HOUSTON LOS ANGELES
PHOENIX SAN FRANCISCO SEATTLE TORONTO SUMMERVILLE, S. C.

When the VOICE of the


ELECTRICAL WORLD
NATIONAL RECOVERY ISSUE
A statement of past achievements, present problems and immediate objectives from a united industry, directed to legislators, industrialists and other leaders of national thought and action in a constructive endeavor to show the competency of the electrical industry to stimulate national business recovery.
MARCH 30, 1935

ADVERTISING

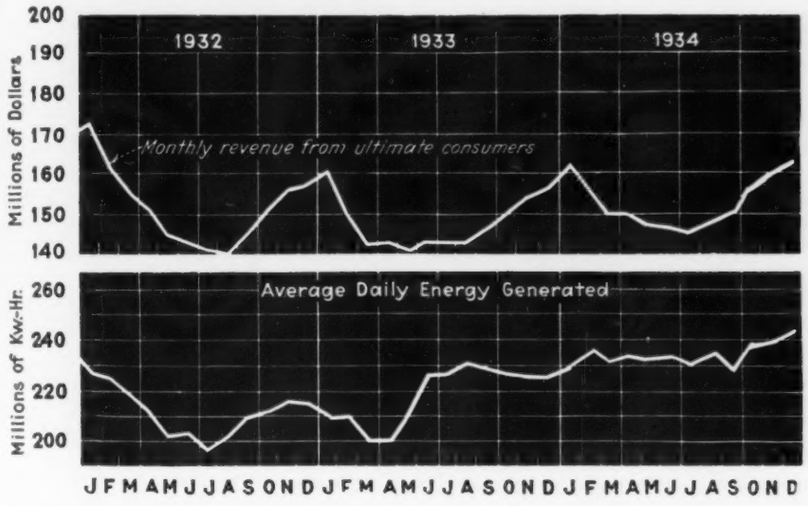
Year-End Revenue Up 4.9%

INCREASED activity in the electric light and power industry carried December revenue 4.9 per cent above the preceding year's figure for the month to a total of $163,806,700, according to the Edison Electric Institute. This overshoots both of the past two winter peaks, with the January returns—normally about $6,000,000 above December—still to come. It closely approached the revenue of the like month in 1928, but remained less than in 1929, 1930 and 1931.

Energy output increased 8.5 per cent, total production being 7,582,000,000 kw.-hr. This was about the same as in December, 1930, and was larger than in any other month during the three intervening years. The greater part of the increase was supplied by water power. This rose 18.2 per cent over December, 1933, and constituted 40 per cent of the total. Output from fuels increased 2.8 per cent.

With December revenue and energy well above 1933 figures, all major consumer groups show sustained improvement.

Among the major consumer classes the rise of 11.6 per cent in sales for large light and power stands out. The negligibly small decrease from November is exceptional and indicates sustained industrial activity. Domestic sales rose 6.7 per cent over the like month of 1933 and were the largest for any December in the history of the industry. Total sales to ultimate consumers were 7.7 per cent greater than a year ago, exceeded those for the month in every year except 1929 and 1930 and missed the record of 1929 by only 5.5 per cent.



Year's total exceeds estimates

Inclusion of returns for the final month brings the year's totals slightly above the estimates previously published.

Revenue totaled $1,837,046,000, or 3.6 per cent over 1933. Sales to ultimate consumers amounted to 70,781,780,000 kw.-hr., up to 7.6 per cent. Revenue allocation was as follows, in thousands of dollars, with corresponding percentage gains over 1933 in parentheses:

a Domestic 677,697 (+3.2), *b* small commercial 511,682 (+2.4), *c* large commercial 495,657 (+6.5), *d* municipal street lighting 92,984 (—1.4), *e* street railways 37,838 (+4.1), *f* electrified steam roads 6,726 (+2.7), *g* municipal and miscellaneous, 14,461 (—2.2).

Corresponding energy sales, in millions of kilowatt-hours, were: *a* 12,798, *b* 13,151, *c* 36,919, *d* 2,203, *e* 4,352, *f* 703, *g* 657.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1934	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen	Per Cent Inc	Gen	Per Cent. Inc.
December	163,807	+4.9	7,582	+8.5	3,029	+18.2	4,553	+2.8
November	160,451	+4.2	7,203	+6.3	2,801	+20.4	4,402	—1.0
October	155,811	+3.6	7,424	+5.5	2,542	+ 4.7	4,876	+6.0
September	150,196	+2.4	6,845	—1.0	2,272	—16.2	4,573	+9.1

Table II—Regional Revenue and Energy Output in December, 1934

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr *					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	163,807	+4.9	7,582	+ 8.5	3,029	+18.2	4,553	+ 2.8
New England	13,990	+0.7	541	+ 6.2	272	+23.5	269	— 6.6
Middle Atlantic	49,611	+5.3	1,969	+ 5.0	613	+ 3.2	1,356	+ 5.8
East No. Central	36 964	+5.5	1,796	+ 5.2	200	+42.5	1,596	+ 1.7
West No. Central	14,273	+6.2	541	+22.8	166	+98.5	375	+ 5.0
South Atlantic	20,234	+3.5	875	+10.7	560	+52.0	315	—25.7
East So. Central			328	+37.0	274	+50.5	54	+ 8.0
West So. Central	8,512	+4.3	356	+11.5	21	+193.0	335	+ 7.5
Mountain	4,816	+8.4	251	+11.3	171	— 3.3	80	+66.0
Pacific	15,407	+6.6	925	+ 8.0	752	— 1.7	173	+90.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.

Table III—Allocation of Energy December, 1934

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc
Total for distribution*	7,538	+ 7.5
Lost in transmission, etc.	1,412	+ 7.1
Sold to ultimate consumers	6,126	+ 7.7
Domestic	1,224	+ 6.7
Com'l, small light and power.	1,192	+ 4.8
Com'l, large light and power.	2,969	+11.6
Municipal street lighting	206	— 3.0
Railways—street, interurban	418	+ 7.9
Railroads—electrified steam.	64	+ 1.9
Municipal and miscellaneous	53	—35.3

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

Yellow Gum from "Blue Earth"

King Tut's sarcophagus was varnished with melted amber. That was the hardest resin known then, and it still is. The ancient Phoenicians valued amber highly and braved the storms of the Atlantic in their triremes to gather it from the shores of the Baltic.

The Baltic is still the greatest amber region of the world. On the shores of East Prussia it occurs in colored sand called "blue earth." Amber was one of the first resins used for insulating varnish, but because of its high cost it has been replaced by other materials.

◆

Research has brought to light many curious as well as valuable facts about materials for electrical insulation. And, for 50 years, Westinghouse has maintained constant research to develop the finest possible insulation. Westinghouse insulating materials are made to keep your equipment on the job. Make your insulation dependable . . . specify Westinghouse. Send for new booklet C-2033, "Making Insulation Fit the Job." Address Westinghouse Electric & Manufacturing Co., Dept. 100, East Pittsburgh, Penna.

◆

Varnishes - Cements - Compounds - Treated and Untreated Fabrics and Papers - Micas

◆

Westinghouse

INSULATING MATERIALS

R-89010

LETTERS TO THE EDITOR

What the Public Thinks of Utilities

Recently I took part in an engineering investigation made for the purpose of aiding and promoting the wider use of electricity. This investigation was carried out in the territories served by fourteen separate utility companies located in twelve different states east of the Mississippi. It required a visit to the premises of the customers, thorough inspection on each of the properties and detailed tests in a number of cases. About 50 commercial and industrial establishments of varying size and character were visited and about 100 homes, ranging from a minimum class of residence development to some of the finest urban and suburban homes. These locations were picked so as to obtain representative technical conditions on the premises, with little thought given to the opinion held by the customer of the utility.

The procedure followed was, first, to explain in detail the methods for carrying out the investigation to an official of the utility in the territory, and then proceed to the individual inspections with a junior employee of the utility company to make the initial contact and obtain permission from the customer. In several of the territories, when the procedure was outlined to the utility official, although he approved of the methods he was doubtful of the reception which would be received at the hands of the customer. The investigation, of course, involved some inconvenience and annoyance to the customer, and it was pointed out that the customers perhaps were not in a mood to be even slightly inconvenienced to assist the activities of the utility. The investigators were cautioned that they should not be surprised to have some of the customers refuse permission to enter and inspect their premises.

The customers, on the other hand, after a very brief introduction as to who the investigators were, and the purpose of the investigation, gave permission in every case to carry through the desired inspection and tests. In a few cases an inquiry was made whether our investigation would increase the monthly bill. When assured that the investigation would not increase the bill, and was aimed only at a wider and greater use of electricity, any reluctance on the part of the customer was removed. It was found that a rainy Monday was a bad day for making inspections on residential premises, but only because the housewife was very apologetic regarding clothes hanging in the basement. On several occasions more discussion was required to prevent the housewife from taking down the clothes in the basement, so as not to inconvenience us, than was ever required to obtain permission for the investigation. In a number of cases the reception was cordial and the members of the household, or the head of the industry, made somewhat of a social occasion of our visit and carried on a general conversation during the whole time of the inspection and test.

Although 150 customers is a small sample of the several million in the territory visited, it is reasonable to believe that the uniformly friendly opinion of these people toward the utility is a better pointer of the direction of public opinion than the politician or the soapbox orator from whom so much has been heard in recent months.

J. O'R. COLEMAN,
Engineer,
Edison Electric Institute

◆

"Purchased Power in Breweries"

To the Editor of ELECTRICAL WORLD:

Your introductory note to my article on "Purchased Power in Breweries" in your February 2 issue is very flattering, but unfortunately conveys the wrong impression of the experience I have had in this work. All of my experience in this country was gained *before* and *after* repeal, and not before and during prohibition. This is particularly embarrassing because my friends know that I was in Europe before and during a large part of the prohibition era, and therefore could not have gained any experience in this country during that time.

Would you please be kind enough to have some sort of correction inserted, as this error may prove to be detrimental to me.

There is also an error in the article, under the side-heading "Sources of Waste," in the first line. The word "poor" in "equipment of poor efficiency" has been omitted, making the sentence practically meaningless.

GILBERT WILKES,
Consulting Engineer,
Jacksonwald, Reading, Pa.

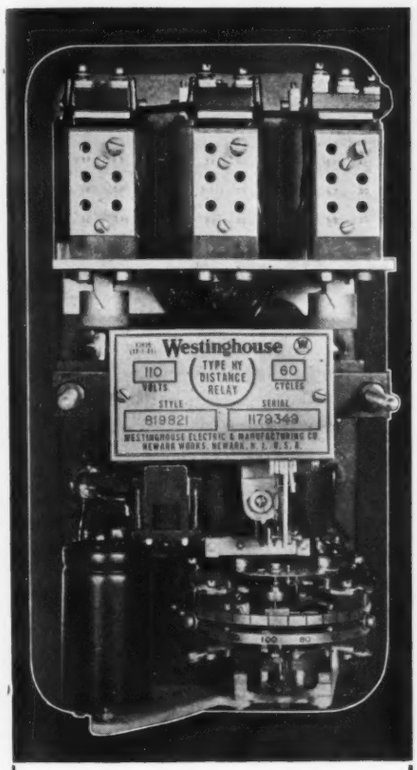
◆

Holding Down Fixed-Charge Burden

To the Editor of ELECTRICAL WORLD:

I quite thoroughly agree with Mr. Clark's comments on reducing the cost of power stations, presented in the January 19 issue of ELECTRICAL WORLD. Keeping the fixed charges on capital investment down to the irreducible minimum is something that I have been preaching now for some time. I have been stressing this more than the matter of improving operating efficiency, and our engineers talk about "dollar efficiency" fully as much as they talk about thermal efficiency.

Many times I have declined to approve



HY HIGH-SPEED RELAYS

★For the rapid clearing of faults on the shorter line sections where the arc resistance of short circuits may reach a value comparable to the line impedance.

The HY relay possesses all of the many unequalled advantages of the HZ. The essential features of this relay are:

1 A pure impedance element which protects 80% of the line and which will operate within a minimum time of less than one cycle.

2 A timed distance element with modified impedance characteristics to protect the remaining portion of the line.

3 A timed back-up impedance element.

Complete information about the HY will be sent promptly upon request.

Westinghouse

Room 2-N East Pittsburgh, Pa.
R57005

SINCE 1888
METERS INSTRUMENTS RELAYS

or recommend projects which promised to improve our operating efficiency, which is now very good, purely because the carrying charges on the capital required plus maintenance were not sufficiently less than the expected operating savings to make the project worth while.

So far as our Edgar station is concerned, I have repeatedly taken the position that I am not interested in any project which would improve the operating efficiency if it requires any capital expenditure. On the other hand, if some scheme of operating was advanced that would require no expenditure of capital, but would improve operating efficiency, it was worth considering.

I. E. MOULTROP,
Chief Engineer of
Edison Elec. Illuminating Co.,
Boston, Mass.

BOOK REVIEWS

Electrical Engineering (Vol. II) Alternating Current

By C. L. Dawes. Published by the McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 693 pages, illustrated. Price, $4.

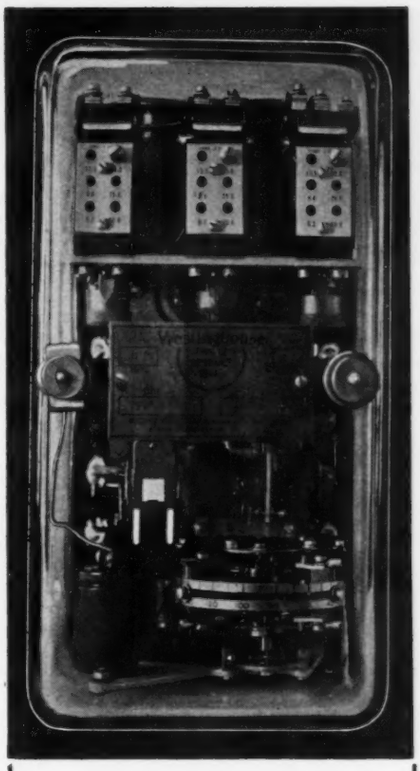
In revising anew the 1928 revision Professor Dawes has eliminated some practices and devices that have passed out and introduced the newer ones. Pentodes, thyratron inverters, double-cage and capacitor motors and the newer types of lightning arresters are evidence of this. The book is not advanced. It has no superfluous words and consequently embraces more of the practices in the field than would be expected in a text of principles, even of this length. The scope is the conventional one of a.c. circuits and apparatus.

•

Modern Polyphase Induction Motors

By Franklin Punga and Otto Daydt. Published by Pitman Publishing Corporation, 2 West 45th Street, New York, N. Y. 289 pages, illustrated. Price, $5.

This is a German treatment of Central European practice in induction motor design. The American translator, H. M. Hobart, had one of the authors as an assitant during his early design activities on induction motors. Few British or American design practices are cited, but for the maker and user here this work serves as an admirable picture of the versatility of the Continental engineer in making springs, centrifugal force, couplings, slots, reactors and other elements control starting and operating characteristics of squirrel-cage, especially double-cage, motors. The mathematical analysis and reasoning are unusually lucid. An appendix goes into the question of harmonics, torque-"saddles" and slot noise. There is no index.



HZ HIGH-SPEED RELAYS

★ For rapid clearing of phase-to-phase, 3-phase or 2-phase to ground faults.

Among the many advantages of this all impedance, 3-step relay are:

1 High-speed operation. Relay operates in one cycle or less.

2 Extremely accurate operation.

3 Synchronous timing device for 2nd and 3rd elements. Distance element on the synchronous timer gives approximate location of fault.

4 Back-up protection assured by the 3rd element.

5 High-speed induction dynamometer directional element which operates over a wide range in voltage and current.

For complete information ask for C.S. 41-415, Type HZ High-Speed Relays.

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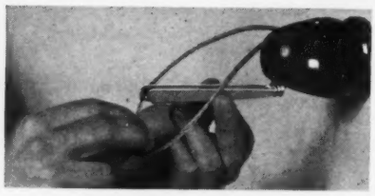
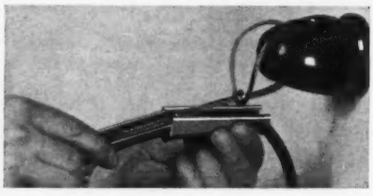
NEW Reliable DEVELOPMENT offers many Advantages

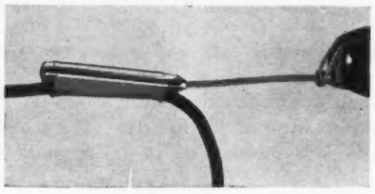
Concentric SERVICE CABLE CLAMP



Attaching bail to fixture.



Clamping shell to concentric cable.



The finished installation—put up to last.

Neat . . . Noiseless . . . Non-Corrosive . . . High Strength . . . Easily Installed . . . Will not injure wire or insulation . . . Low in first cost . . . Economical over long service periods.

Fits any two Conductor No. 8 Concentric Service Cable. Flexible bail permits easy installation on any existing fixture. This clamp is the result of long experience and is practical and dependable. Inspect one now and see its value to you.

SEND FOR A SAMPLE

Reliable Electric Company

3145 Carroll Ave., Chicago

Recent Rate Changes

San Diego Consolidated Gas & Electric Company has been ordered by the California Railroad Commission to reduce its rates $285,000 annually. The commission fixed a return of 6 2/3 per cent "as reasonable on an undepreciated rate base." The reduction in electric rates amounts to $136,000 for domestic service, $132,000 for commercial and $10,000 for street lighting. Manufactured gas rates are reduced $5,000.

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Virginia Electric & Power Company has cut its electric rates $402,000, a reduction that will save the average Richmond consumer approximately 17 per cent. The revised rate is effective with meter readings after March 1. The rate cut, added to the $41,000 slash of January 1, when the home service rate was altered downward (ELECTRICAL WORLD, January 19, page 70), makes a total cut of $443,000 since the first of the year. The commission said that it was "highly appreciative of the spirit of co-operation shown by the management of the company in granting these reductions without the necessity of a formal, expensive and long-drawn-out rate hearing."

•

West Virginia has ordered a reduction of more than $550,000 in rates charged electric consumers in all parts of the state. The commission orders apply to all consumers of electricity furnished by the Monongahela West Penn Public Service Company, the Appalachian Electric Power Company, the Wheeling Electric Company and the Spencer Water & Ice Company. The total reduction to the users of electric service for residential and commercial services are estimated at $487,500 annually and provisions are made whereby municipalities may effect a total saving of approximately $50,000 in street lighting bills. "The rates are designed," the commission pointed out, "to benefit principally residential customers using small quantities of energy. For example, the rate of the Monongahela West Penn for residential service for the first 25 kw.-hr. is reduced from 8 cents to 6½ cents net throughout its northern and to 7 cents net in its southern territory and the service charge of Appalachian and Wheeling Electric have been reduced from 50 cents to 36 cents, with further monthly reduction until by February, 1936, this charge will be reduced to 15 cents a month."

•

Detroit Edison Company is willing to discuss establishment of a system whereby light and power rates would be adjusted downward automatically according to company earnings, as is done in Washington, D. C., Alex Dow, president of the company, stated. "But I won't discuss establishment of any such

system until the rate litigation now before the Ingham Circuit Court is cleared away," Mr. Dow continued.

•

Niagara, Lockport & Ontario Power Company has filed with the New York Public Service Commission a schedule of reduced electric rates that will save consumers approximately $120,000 a year. The main feature in this first step of a simplified rate program, as it affects residential customers, is the complete elimination of the so-called "room count" electric rate base and the substitution of a simple block rate.

•

Blackstone Valley Gas & Electric Company has announced a reduction in rates for electric service in the Blackstone Valley to an amount representing a saving to users of $192,000 a year. The bulk of the saving will go to residential consumers—approximately $150,000.

•

Nebraska Railway Commission has ordered twelve leading power companies either to file data with respect to contracts they hold with municipalities for supplying electric energy at wholesale or show cause why they do not do so. The commission holds that this information is essential to the exercise of its regulatory functions. The companies deny any authority, in the absence of legislative action, over rates or services save in matters of physical connections.

•

San Antonio Central Power Company has filed an application for a 26-year franchise for the construction and operation of an electric light and power plant and distributing system. R. H. Morris of San Antonio, president of the company, is owner of the $10,000,000 electric power plant and transmission system near Guadalajara, Mexico. The company proposes to provide energy for domestic and commercial purposes at rates 25 per cent less than present rates of the San Antonio Public Service Company. The city also has under consideration the obtaining of a loan from the PWA for the construction of a municipal electric plant and natural gas distributing systems.

•

Northern Indiana Public Service Company's voluntary rate reduction, affecting 193 cities and towns (ELECTRICAL WORLD, January 19, page 70), has been approved by the state Public Service Commission. Reductions will be effective as of March 1.

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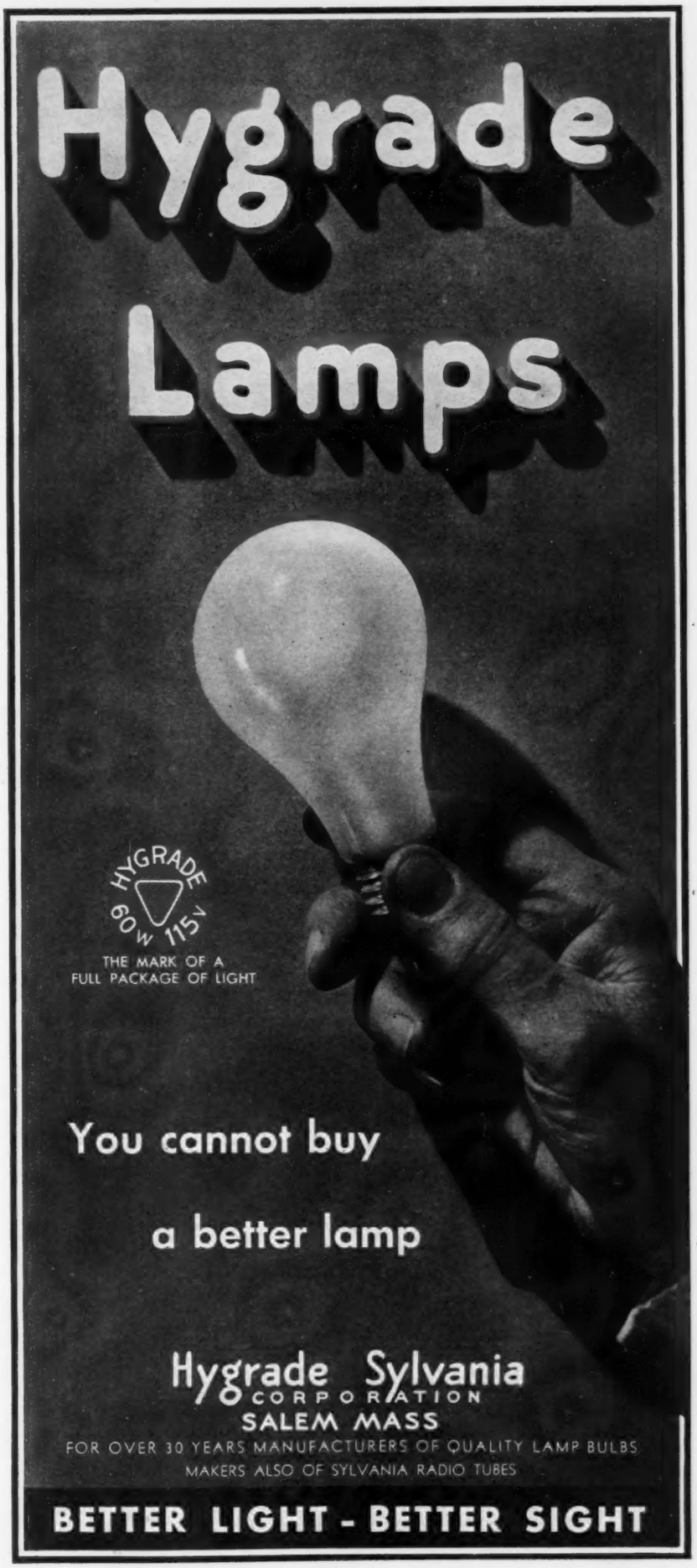
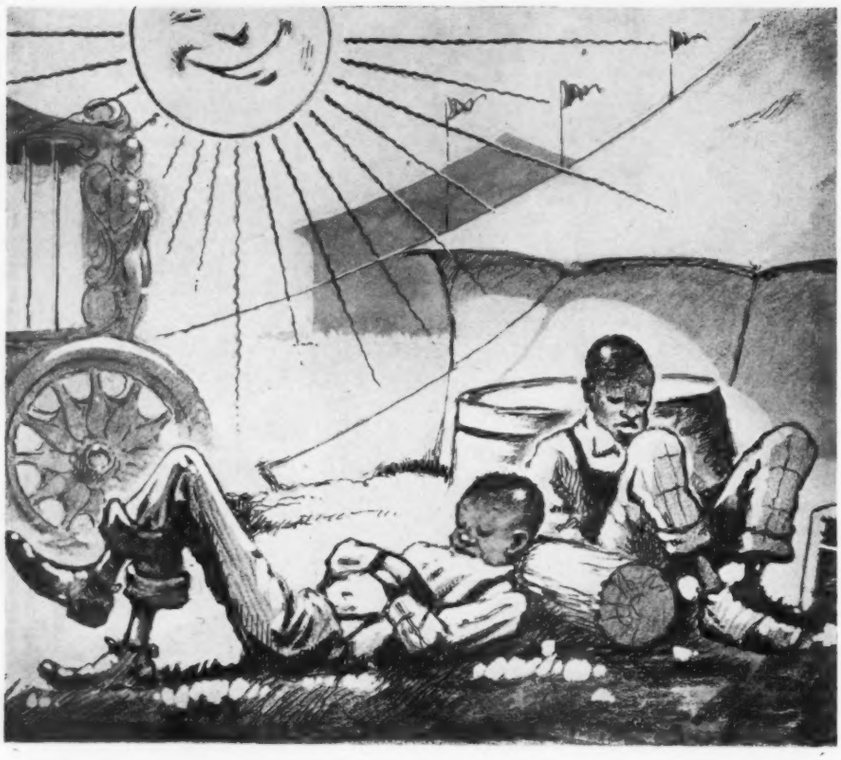
Patchogue Electric Light Company will soon reduce its electric rates $47,000 annually or approximately 10 per cent, according to an announcement made by the New York Public Service Commission.





Specialists . . . IN HEAT RESISTANCE!

Real oldtime darkies thrive on heat that prostrates ordinary mortals. They must have something in common with Rockbestos! For Rockbestos insulated wires can withstand indefinitely heat that dries up and ruins ordinary insulated wires.

Several types of wire insulation are flame-resistant—a comparatively easy thing to get in a wire—but Rockbestos wires are more than just flame-resistant—they are heatproof, too, which is much more important where a wire must withstand high temperatures for years! Recognition of this characteristic of asbestos insulated wire is seen in the fact that when temperatures of 194° F. and over will be encountered only asbestos insulated wire is approved.

When you cut down into the insulation of a Rockbestos A.V.C. cable you can *see* why it is able to stand up under heat, fumes, oil, grease and vapors without failure. The dense, thoroughly impregnated belt of felted asbestos supplemented by a high dielectric insert of varnished cambric doesn't grow hard or brittle with heat or age, can't bloom or swell from oil or grease, can't flow in a hot, moist duct and, of course, can't burn.

The Rockbestos line includes more than 50 varieties of wire, cable and flexible cords. Voltages up to 7500. Sizes up to 2,000,000 C.M. All shown in our catalog-handbook of asbestos insulated wires. Would you like a copy? Rockbestos Products Corporation, New Haven, Conn.

ROCKBESTOS
—the wire with permanent insulation

SALES OPPORTUNITIES IN NEW CONSTRUCTION

SAN FRANCISCO, CALIF.—Great Western Power Company plans hydroelectric power project on North Fork of Feather River in Butte and Plumas Counties, comprising series of six generating stations designed to utilize available water head between present Caribou and Big Bend developments. Plants will be equipped for combined capacity of 400,000 horsepower. Project will include new transmission lines connecting with present system, power substations, switching stations and other field structures. Cost reported over $10,000,000. Application has been made for permission.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, asks bids until March 7 for designing, fabricating, galvanizing and delivering 664 steel transmission towers for new Wilson Dam-Norris Dam transmission line.

JACKSONVILLE, FLA.—Union Bag & Paper Corporation, New York, N. Y., plans installation of power substation equipment, motors and controls, regulators, conveyors and other equipment in proposed pulp and paper mill, and paper converting plant at Eastport, Jacksonville. Project will consist of several multi-story and one story units. Negotiations under way with City Commission and County Commissioners for tract of about 1,200 acres of land. Cost over $3,000,000.

CHICAGO, ILL.—Armour & Company, meat packers, plan installation of motors and controls, conveyors, electric hoists, etc., in new abattoir and packing plant on Forty-third Street. Cost about $500,000.

CHATTANOOGA, TENN. — Tennessee Electric Power Company is arranging fund of $350,000 for extensions and improvements in electrical facilities in Chattanooga district during 1935, including new transmission and distribution lines in rural districts, improvements in city line facilities, additions and improvements in power substations and miscellaneous work.

PORTLAND, ORE.—United States Engineer Office, Customhouse, receives bids until March 8 for two Diesel engine-generator sets for 117-foot Diesel electric survey boat (Circular 432).

PITTSBURGH, PA.—Jones & Laughlin Steel Corporation plans installation of motor-generator set, heavy-duty motors and controls, regulators, conveyors, electric cranes and hoists and other equipment in new steel blooming mill on South Side. Cost over $3,000,000.

FARIBAULT, MINN.—State Department of Administration and Finance, St. Paul, plans installation of underground power transmission line between School for Blind and School for Feeble-Minded, Faribault, including transformers, panelboards, etc. Soon takes bids. Pillsbury Engineering Company, Minneapolis, Minn., is consulting engineer.

ELIZABETH, N. J.—Wilson-Jones Company plans installation of motors, controls and other equipment in new addition to local paper converting plant. Cost close to $150,000.

BOONE, IOWA—Has engaged Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer, to prepare plans for proposed city-owned electric light and power plant, and electrical distribution system. Cost over $800,000.

SAN FRANCISCO, CALIF.—Associated Oil Company plans installation of motors and controls, compressors, regulators and

other equipment in connection with expansion and improvements in oil refining plants at Avon and Watson, Calif., during 1935, for which a fund of about $575,000 is being appropriated.

WASHINGTON, D. C.—Chief of Ordnance, United States Army, asks bids until March 14 for three gas-electric generator sets (Circular 29); until March 13 for one air compressor (Circular 26).

CHICAGO, ILL.—Kraft-Phenix Cheese Corporation, Chicago, plans installation of motors and controls, conveyors, loaders and other equipment for expansion and improvements in plants at Freeport, Ill.; Atlanta, Ga.; Plymouth, Wis., and Montreal, Que., including new additions. Fund of about $1,000,000 authorized for entire project.

REDWOOD CITY, CALIF.—Plans early purchase of local properties of Pacific Gas & Electric Company, and will operate in future as city-owned electric utility. Power will be purchased from Pacific company at wholesale for redistribution, and extensions will be made in power substation and distribution line facilities for such service. Application has been made for permission.

ST. LOUIS, MO.—United States Engineer Office, Customhouse, asks bids until April 1 for construction of new Dam No. 26, Mississippi River, opposite Alton, Ill., including central electrical control station and equipment, electric-operated roller gates and accessories, with gate-operating house.

COOPER, TEX.—Has authorized a bond issue of $104,000 for proposed city-owned electric light and power plant, and electrical distribution lines.

GROVE CITY, PA.—Sharon Coal & Limestone Company has authorized electrification of coal mine No. 2 near city, with installation of new equipment, including motors, controls, electric hoists, etc.

NEWARK, N. J.—Clark Thread Company has contracted with Public Service Electric & Gas Company for electric power service for local mill, with connected load of about 7,500 horsepower, and will discontinue operation of its electric generating plant heretofore used for such purpose. Power substation will be installed at mill site for new central station service.

CHICAGO, ILL.—Electro-Motive Corporation, affiliated with Winton Engine Company, Cleveland, Ohio, both subsidiaries of General Motors Corporation, New York, N. Y., plans installation of power substation equipment, motors and controls, regulators, electric hoists and cranes, conveyors and other equipment in new multi-unit Diesel locomotive manufacturing plant on site acquired near Chicago. Cost over $600,000.

HIGH POINT, N. C.—Plans new city-owned electrical distribution system. Cost about $300,000 with transmission lines and power substation facilities. Proposed to arrange financing at early date.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, asks bids until March 8 for quantity of electric cable, cord and wire (Schedule 4348); until March 12 for 16,000 electric batteries and 110,000 electric flashlight batteries (Schedule 4354), both for Eastern and Western Navy Yards.

GRAND HAVEN, MICH.—Michigan By-Products Coke Company, care of Leo C. Lillie, Grand Haven, president, recently organized, plans installation of motors and controls, electric hoists, conveyors, loaders, transformers and accessories, and other equipment in new metallurgical coke and byproducts plant, with initial capacity of about 300 tons per day. Cost about $1,500,000. Company will be affiliated with Grand Haven Terminals Company, Grand Haven.

SANTA MONICA, CALIF.—Plans ornamental street-lighting system on Ocean Avenue and has authorized immediate estimates of cost.

Mr. Adams.
Transmission
ENGINEER
QUICK, JAMES, THE B.T.C. CATALOGUE!
TCH! TCH! SUCH LANGUAGE!!
NOPE, WE DID NOT SKETCH THIS FROM LIFE, BUT ANY ENGINEER WILL FIND THE COMPLETE LINE OF B.T.C. HI-LINE HARDWARE A
SIMPLIFIED AND SAFE METHOD OF ORDERING. MANUFACTURED BY THE BREWER-TITCHENER CORP. ORDER THROUGH YOUR INSULATOR MFGR. only!
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HERE is a set of books that should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Covers all types of motors, from those used in small household and commercial appliances of all kinds to mining and railway motors. Explains the principles underlying the different types of windings and gives definite instructions for doing the various rewinding jobs; also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results.

Do you ever need information on:

—how to clean slots, true up laminations, insulate ends and build up new cores
—what to know about loop windings and how to handle them
—testing and locating faults in small alternating-current motors before stripping them
—rewinding small universal motors
—changing single phase windings for two and three phase operating
—how to lay out and use two phase lap windings
—laying out and connecting a pyramidal winding
—how to make voltage changes in induction motors
—how to make alternating-current windings for different frequencies
—laying out wave windings for alternating-current rotors.
—complete rules for frog-leg windings
—how to lay out and check up three phase diagrams

There are 1,079 pages of practical shop methods and data like these in this Library. It is a complete, up-to-date key to the repair of all motors. Nothing else in it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

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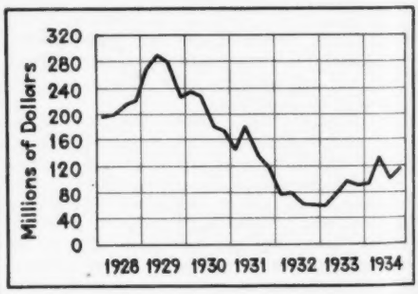
Orders Rise 35 per Cent

New orders booked for electrical goods during 1934 were 35 per cent greater, in dollars, than during 1933 and surpassed the value of those booked in 1932 by 56 per cent. The comparisons are based on reports made to the Bureau of the Census by 78 representative companies, the figures being announced by the bureau not as a complete census but as indicative of the trend.

As reported in the ELECTRICAL WORLD of January 5, the value of electrical goods manufactured during 1933 was close to $550,000,000. Assuming production to have risen proportionately to orders, the indicated value of products in 1934 was about $740,000,000.

While the electrical industry has been obliged to adapt itself to a particularly severe decline from peak conditions, it has also benefited notably by the more recent improvement. Orders in 1932 dropped to 26.5 per cent of those in 1929, but rose to 30.5 per cent in 1933 and 41 per cent in 1934. The upward trend in the past two years brought orders in the last quarter of 1934 to more than double the value of the first quarter of 1933 and 35 per cent above the fourth quarter of that year.

Figures for earlier years as now announced differ from those formerly given to take account of a change in the number of companies reporting.



Quarterly orders for electrical goods

Reported by 78 manufacturers
(In millions of dollars)

Year	Total	First Quar.	Second Quar.	Third Quar.	Fourth Quar.
1934.....	439	92	128	100	119
1933.....	325	58	80	99	88
1932.....	282	77	79	63	63
1931.....	579	147	181	132	119
1930.....	814	236	229	181	168
1929.....	1,065	270	285	280	230
1928.....	826	195	200	213	218
1927.....	762	197	188	193	184
1926.....	818	215	201	197	205

Furnaces to Be Made Abroad

Arrangements have been completed with the Birmingham Electric Company of Birmingham, England, for the manufacture and sale in Great Britain, the British Empire and certain other European countries of the Detroit Rocking electric furnaces. This furnace will be manufactured and sold abroad under the name of "Birlec Detroit Rocking Furnaces."